Bangladesh Multipurpose Shelter Report

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I. Cyclones in Bangladesh: Overview of Emergency Management Issues

The coast of Bangladesh has been hit by twenty severe cyclonic storms since 1905. The April 1991 was one of the most destructive of these. Although effective government action saved thousands of lives, 130,000 Bangladeshis died. In framing responses which will reduce the loss of life in future storms, it is useful to assess the problems of cyclones in the framework of four categories of vulnerability.

Geographic

The degree to which an area is at risk from a cyclone is determined by the geographical character of the area:

Coastal features. Islands and peninsulas are typically more susceptible to surge and wind than bays, estuaries, and straight coast.

Bathymetry. The features of the ocean bottom affect the size of waves which accompany surge. A shallow coast allows waves to build up. Tide levels during the surge affect the ultimate surge height.

Topography. Flat coastal plains allow surge to penetrate inland. Evacuation distances are longer.

Demographics

Population. Densely populated areas near the coast require longer evacuation times. Transient populations are difficult to reach and have access to fewer, if any, of the coping mechanisms provided by more stable economic situations. Conflict between transient peoples and sedentary communities is destabilizing and hinders development.

Structures. Buildings which would make acceptable structures must be strong enough to resist surge and wind and accessible. They must be large enough and exist in large enough numbers to house the population expected to reach them.

Infrastructure. A sufficient number of all weather roads make evacuation inland or to a suitable shelter feasible. Embankments, dikes, or other sea-wall type structures hold out or inhibit surge. Raised mounds provide high ground for animals or people.

Social and Psychological Motivation

The reactions of the populace to the storm depends on:

Warnings. A well designed warning which reaches the entire populace well before high winds and water reach the area results in less hysteria and more effective evacuation.

Hierarchy of Other Needs. Deaths increase when the need to evacuate is subordinate to the need to remain in the high-risk area. Other cultural needs can conflict with evacuation.

Level of Economic Development

The capacity of a populations to provide their own protection from a storm. High economic development may provide:

Vehicles for evacuation.
A secure storm-proof house to protect a family from the storm.
Ability to secure belongings.

Poor populations cannot protect their belongings easily. They are more likely to choose to stay and protect economic interests in the high-risk area than to evacuate.

The geographic characteristics of coastal Bangladesh make it one of the most dangerous places in the world for cyclones. The combination of exceptionally flat landscape, a relatively shallow deltaic bathymetry, and high tide fluctuation are conditions under which surge can be high and penetrate several kilometers inland. The large number of islands are particularly vulnerable.

Bangladesh has an extremely large coastal population. Although estimates vary depending on definition of "high-risk" area, the population of the coast likely to be affected by surge is put at around six million. Much of that population is transient - working on fishing boats, in seasonal agriculture, or wandering looking for any employment. Some storm shelters exist, but not nearly enough to house the vulnerable population. In most developed areas, some strong masonry (pucca) structures are available for shelter. On most of the islands and in the recently accreted areas of the coast, there are few buildings which can provide adequate shelter for the inhabitants of the area. The road infrastructures are meager and poorly maintained, especially in the recently accreted areas, but some coastal areas adjacent to urbanized areas (Chittagong and Cox's Bazaar) are served by paved highways.

The Bangladesh Meteorological Department has relatively sophisticated capability to provide early warning. Warnings are issued over Radio Bangladesh and through the Red Crescent/Ministry of Relief Cyclone Preparedness Programme (CPP). The CPP system for passing warnings on to the at-risk population is well organized, but, at the present, does not cover the entire at-risk area. In areas where there were no Red Crescent/CPP volunteers, many families did not receive any warnings. The warnings broadcast by Radio Bangladesh reach a limited number of the coastal population due to the scarcity of radios among that population. Two numerical warning systems are used which sometimes causes confusion about the meaning of the warning.

Among the coastal populations the reactions to an approaching cyclone vary. Many people did move to the shelters or travel inland soon after being warned that a destructive cyclone would hit their area. But even when the warning that a severe storm was imminent, a very significant number of the at-risk population did not attempt to evacuate. Many lost their lives by leaving too late to travel to a shelter, higher ground, or away from the coast. As is the case in all countries affected by cyclones, warnings have been issued in the past which were not followed by dangerous storms. The subsequent "warning fatigue" contributed to widespread disbelief of the warning in April 1991. "Warning fatigue" must be understood in the context of the capacities of the coastal population to respond to warnings. Rather than say that warnings occur too often, it may be more accurate to say that poor coastal families do not feel they can often afford to react to warnings by taking the precautions which wealthier observers would consider prudent. Some people did not evacuate immediately because they did not understand the effects of such a severe storm. Waiting to evacuate meant that many people tried to move to the shelters after dark, when lack of light, higher winds and rain made travel exceptionally difficult.

Most of the population in the high risk areas live there only because their poverty - and their inability to protect the possessions which represent their livelihood - makes them choose to take the risk: fishermen would not abandon their boats, squatters and others with tenuous claim to their land would not leave for fear of losing their claims, and others who were paid to occupy land or were responsible for equipment or crops for absentee landlords did not leave for fear of losing their employment. Many stayed in their homes to protect possessions from looters.

In the wake of the April 1991 storm, the Government of Bangladesh and the International community have renewed their commitment to avoiding the enormous and tragic loss of life which occurred in that storm. To this effect, the World Bank has asked the Multipurpose Cyclone Shelter Programme Team to develop plans and recommendations on the sheltering needs of coastal Bangladesh. The Multipurpose Cyclone Shelter Team has asked INTERTECT to provide assistance in examining disaster management issues associated with cyclone shelters. This report will look at the issues of warning, awareness, and shelter management within the context of the risks, vulnerabilities, storm psychology, and economic development in coastal Bangladesh. It is impossible to adequately discuss the problems and solutions associated with warning, awareness, and shelter management without also considering associated issues within the broader context of general emergency preparedness, thus all discussions will framed by comments on other factors which affect general emergency preparedness in the area.

II. Relevant Experience in Other Countries

A. Disasters and Development

When storms or earthquakes strike the US or Japan, damages are usually minor (Wijkman et al., 1984). However, when natural events of similar magnitude strike developing countries, the injury and death rates are often 100 times greater (Kates, 1980). For example, according to the Earthscan Briefing Document, the average annual death toll from natural disasters in Japan is 63, while in Peru it is 2,900 (Anderson, 1985), in spite of similar characteristics and overall disaster vulnerability. In spite of the fact that the number of disasters is remaining relatively constant, Japan has developed to the point where disaster-caused damage and loss of life has been reduced to a very low level.

In the past disasters were viewed as separate events requiring a rapid response of medical and material aid. This view was not entirely accurate and leads to efforts that are not only ineffective, but in many cases counterproductive. When only emergency needs are met with outside supplied relief, even if totally effective, it does not address the roots of the victims vulnerability: poverty and underdevelopment (Cuny, 1983)

At present, relief agencies are now likely to frame the problems posed by disaster as "how to get the educational message out" instead of "how do we bring the relief goods in." This is due to the realization that disasters are recurrent rather than single events - the same types of disaster strike the same nations repeatedly - and that vulnerability must be addressed by mechanisms for coping with the recurrent disasters from within the vulnerable populations. the recurrent nature of disasters, especially floods is well illustrated in Bangladesh, as well as the Amazon basin in Brazil, Indonesia (1975 and 1978), the Rappahonak River in Virginia, U.S.A. (1975 and 1986), and Pennsylvania, U.S.A. (1963 and 1967). The fact that technological and social/organizational remedies exist make disaster relief an area where education must be an integral part of a strategy of both recuperation and pre-disaster planning (McGinn, 1985).

B. The Victimization of Victims

Countries on the road to development experience a disaster and suddenly lose momentum. This occurs for many reasons, but one of the largest is the creation of a corrosive dependency through relief distribution. It is a phenomenon which has been documented following many disasters (Cuny, 1983). Often the development process of the entire regions can be set back for years as a result. One NGO had a project in Botswana which used its offices for emergency relief distribution. Staff found in impossible to resume normal programming for three years because the local people refused to work for their own benefit without compensation.

Anderson and Woodrow (1988 and 1989) noted that the massive feeding effort in Ethiopia in the mid-80s has had a pernicious effect on the local work ethic. More disturbing, the lesson which the famine victims learned was to wait for outside solutions rather than to develop self-reliance. In Colombia where there is a long tradition of emergency relief distribution, NGO staff have noted the creation of a new class called "the professional victim." These are people who actually move their families to disaster areas so that they can claim to be victims and receive relief. The Nevado de Ruiz (Colombia) volcano eruption destroyed the town of Armero, killing 22,000 of its 30,000 inhabitants. Relief organizations working in the area eventually aided about 60,000 people, and the official government program identified more than 28,000 "victims" (Parker, 1989).

Avoiding a similar dependency pattern in Bangladesh is essential to its long-term development. The tendency to demand compensation for working for the victims' own benefit has become so strong in coastal Bangladesh that in one village people told the consultants that if any NGO wanted to store relief food for the future cyclones in town, the villagers would have to be paid for "watching" it. The cost of watching was placed at 200,000 takas.

C. The Shelter Solution

In their response to the need for shelter during a cyclonic-type storm, different countries have used a number of approaches:

1. Building Shelters. Belize, Jamaica, and other Caribbean nations as well as the Philippines have built some shelters, but these are generally built to protect from the wind only. Rarely is the shelter meant to protect the users from high water. India is the only other country which has built a significant number of public shelters to specifically address the danger of high water.
2. Designating Public Buildings as Shelters. This occurs in all islands of the Caribbean, the Philippines, the U.S., India, and in most every other country affected by cyclonic storms.
3. Designating Commercial Buildings as Shelters. In the U.S. and in the Virgin Islands hotels which are built to specific engineering standards are often designated as hurricane shelters. In Europe, commercial buildings are designated for use as bomb or nuclear fallout shelters.
4. Building Houses on Stilts. Private housing in Thailand and Indonesia is often built a few meters above the ground. Recent programs have emphasized building practices to improve the strength of housing built to avoid high water.

5. Roads and Bunds for Evacuation. In the U.S. and in the Caribbean, the government has developed programs to improve coastal road systems and bridges to assure evacuation routes.
6. Construction of Raised Earthen Mounds. This concept is used in India and Bangladesh. Most other countries have both high ground within a short distance from the coast and effective evacuation systems.
7. Elevating Affected Areas on Island. The best example of this is the town of Galveston, Texas, U.S.A., site of the most devastating natural disaster in U.S. history (in terms of lives lost). After the 1905 hurricane, Galveston Bay was dredged and the fill used to raise the entire town of Galveston above the expected surge level.

D. The Caribbean

One of the most storm-vulnerable areas of the world is the chain of islands found in the Caribbean. The islands first joined together to form the Pan Caribbean Disaster Preparedness Program (PCDPP) in order to improve warning and evacuation procedures, share a shelter management plan and in general reduce the vulnerability of their populations to storms. This organization has recently been replaced by the Caribbean Disaster Emergency Response Agency (CDERA). The consultants interviewed several of the top officials in the various Caribbean disaster preparedness and response organizations. Some parallel situations provide a useful comparison to problems in Bangladesh.

Shelters and Awareness

In one major aspect, the situation there is significantly different. The mountainous character of most islands provides plenty of high ground to which the people can evacuate. Damage to buildings tends to be caused by high winds and not water. Most housing damage is confined primarily to the roof. Although there are small flood plains on many islands, there is always high ground within easy walking distance. There is a risk to people in low-lying areas from storm surge and government awareness programs concentrate on changing the local perceptions of the risk involved with staying in your own home during high winds.

According to Dr. Blanche Carvey, the current director of PCDPP, the major problem faced by the island governments is getting people to evacuate the low-lying area and to come to the storm shelters in a timely fashion. In a recent study of the Jamaican experience undertaken by Dr Carvey following Hurricane Gilbert, the government found that the main reason that people did not evacuate was the fear of loss of personal possessions. This fear was a factor in the decision-making process of families across the economic spectrum: the researchers noted that even when families lived in concrete buildings which offered

substantial security from robbers and looters, they were afraid to move to the shelters and leave their homes locked.

In order to maintain community awareness of storm hazards, the Caribbean islands undertake a number of measures. At the beginning of each cyclone season, all government entities are required to spend several weeks promoting storm awareness in the vulnerable areas. Police and fire services, the army, local government, the schools and health clinics all join in the campaign. They do this on the same schedule so that the message comes at the population from all sides: saturation coverage is the goal. Additionally, all the islands have a program of Face-to-Face courses. These are awareness courses taught periodically in every village. These talks attempt to reach each family. The courses explain the nature of hurricanes, the risks they pose, evacuation procedures for each neighborhood, measures for protecting homes and property, and shelter assignments for the different target populations.

The Caribbean governments have devoted some effort to identifying folklore about storms. The islanders have a number of beliefs about the color and state of the sea which they claim tell them that a major storm is coming. These beliefs have been incorporated into the awareness and warning system as much as possible. The Caribbean experience is that the people are much more likely to heed educational messages which make sense to them, that is, which use their vocabulary and belief systems. Officials in the Caribbean note that evacuation is much more thorough in areas where cyclonic storms are more frequent and compliance is particularly high right after major events. Awareness programs work best where the memory of disaster is still fresh. Officials in the PCDPP emphasized the importance of maintaining local awareness and building on the experience of local populations with storm hazards.

All Caribbean countries now have Designated Shelter programs. This entails is the identification and use of public buildings for shelter purposes. Most often the Designated Shelter is a school, although churches and health clinics are often brought into the overall shelter scheme in areas where the schools do not suffice. Schools are required by law to be constructed according to a special high-wind-resistant building code which makes them hurricane-safe. The storm shelter system in the Caribbean is managed by school headmasters. This responsibility is specified in their job description and written into their contract.

The country of Belize unsuccessfully tried another approach. Belize constructed a small number of buildings which were to be used exclusively as storm shelters. The PCDPP staff noted that Belize had so many problems with maintenance, vandalism and misuse in their dedicated shelters that they have been abandoned. Belize currently uses the Designated Shelter system described above.

Warning

Although there is a storm warning system in use throughout the Caribbean for ships, PCDPP officials found that these are only fully understood by sea captains. As a consequence, complicated navigational warnings are not broadcast over local radio stations aimed at the general public. Many nations of the Caribbean use a version of the simplified Saffir Simpson system (see Appendix D). The Saffir Simpson scale is a five point system which is oriented towards the risks run by concentrations of human population, predicts levels of damage, and estimated wind speed. In some nations, a phrasal hierarchy is used to advise the public about the danger from an approaching hurricane. In the Cayman islands a "Warning" is issued when a storm is formed, but not of immediate danger to the islands. When the storm threatens the island a "Watch" is issued, and "Danger Warning" is broadcast when the storm is very close (see *Hurricane - Cayman Islands Hurricane Information* in Appendix A). The Caribbean officials contacted by INTERTECT believe that this system is well understood by the populace in costal areas.

E. India

The east coast of India - Tamil Nadu, Andhra Pradesh, Orissa, and West Bengal provinces - shares the effects of the cyclones in the Bay of Bengal with Bangladesh. Frequency of cyclones is approximately the same as in Bangladesh. Although storms striking the Indian coast are comparable in severity to those which have hit Bangladesh, damage and loss of life has not been as severe as in Bangladesh primarily due to a more advantageous geographic situation. Most of this area is a narrow coastal plain extending one to twenty kilometers inland, but usually rising several meters within the first five hundred meters from the sea. Small hills which provide some refuge from storm surge are common in the coastal plain. Much of the plain, particularly the land immediately adjacent to the ocean, is extremely sandy and can not profitably be cultivated. Perhaps due to this, there is less agricultural attraction to this area and the population density in the venerable areas is typically less than in coastal Bangladesh. Because the coastal area is less suitable for annual crops, the area has some tree cover.

Shelter Construction

Previous to the devastating 1977 cyclone, some shelters had been built, primarily in Andhra Pradesh. Some of these shelters collapsed during that cyclone. Many other buildings which were used as shelter were submerged by the surge. In fourteen of the buildings to which people had fled, there were no survivors (Thompson, 1987).

Experiences of the 1977 cyclone spurred the Indian national and state governments to develop projects aimed at reducing the vulnerability of the coastal population, particularly in Andhra Pradesh. International aid agencies, local NGOs, and the government of Andhra Pradesh began programs to build shelters and started cyclone preparedness programs. In Andhra Pradesh some shelters are built by state construction organizations, the Panchayat Raj Engineering Department, and the Roads and Building Department. In some cases, these organizations were also responsible for maintenance. Most were built on an ad hoc basis, subject to a variety of factors: need, population density, and identification of an additional use for the shelter. Shelters built by NGOs were often constructed in areas where the NGOs already had programs which could use sheltered spaces.

Shelter Use and Management

Many shelters were built as additional space for schools. Although a few shelters have been built with no other purpose but to provide shelter in a storm, most are now being used for other purposes - schools, government agency offices, NGO program offices, community centers, vocational education training, government guest houses, and warehouses. According to NGO and government officials, quality of construction and maintenance varies. Those shelters used for other purposes generally are maintained better than those which are used only as shelters during cyclones.

In Orissa, where the losses from cyclones have been less than in Andhra Pradesh, the program to build shelters has not had the impetus it has in Andhra Pradesh. Eight shelters have been built in Orissa for a vulnerable population of 450,000. There the emphasis is on use of the shelters for the old and weak or that part of the population which could not move inland quickly enough to escape storm surge.

After construction, usually with the help of a western aid agency, the shelters are turned over to the organization which will use them, and become responsible for their maintenance. In some instances, it has been difficult to find organizations willing to assume this burden, and 'ownership' of many of the shelters remains undecided years after the construction is completed. Officials and NGO workers report that maintenance of the shelters is a problem. Those shelters used as schools are not kept up due to inadequate government funding.

Use of the shelters seems dependant on a number of factors. Government relief and NGO officials indicated that traditionally shaped buildings in normal uses (eg. schools) received much better acceptance than unconventionally shaped buildings (circular buildings). In addition, they felt that square or rectangular plans were more efficient and better lent themselves to normal use. In Andhra Pradesh, the plan offered by the Centre for Disaster

Management and Rural Reconstruction placed the cyclone shelters in the center of a village for best access (see Appendix E).

Warning and Evacuation

The use of the shelters has not had a significant test since the 1977 cyclone. The large cyclone of 1980, which hit Orissa, and of 1990, which hit Andhra Pradesh, did not have high surges. The actual hydraulic effects of the surge on the shelters is still unknown.

A great deal of attention has been given to warning dissemination and evacuation since 1977. In the cyclones since, the government has been better prepared and the warning has been heard more widely. Heightened awareness and preparedness by the government and coordination between the government and other local organization resulted in fewer lives lost. Since 1977, three storms of level 4/5* intensity hit Andhra Pradesh. As indicated in the chart below, loss of life was 5% to 8% of that in 1977.

year of cyclone	deaths
1977	± 12,000
1979	± 700
1984	575
1990	967

[AVS Reddy, 1992]

Each state on the Indian coast has an Area Cyclone Warning Center (ACWC). The ACWC issues a cyclone "alert" approximately 48 hours before the cyclonic winds are expected to begin to affect the coast, and a "warning" is issued about 24 hours before the advent of strong winds. Cyclone bulletins are broadcast over the radio and television with information on the location and expected landfall of the cyclone and instructions to the local people about precautions to be taken, as well as information on evacuation and rescue. Warnings are broadcast every one-half hour. Police wireless are used to convey warnings to local police stations in the event of failure of the public radio and television systems [Government of India, Ministry of Science and Technology, 1986].

The District Collectors (administrator of an upazilla-size area) monitors the cyclone situation as it develops and organizes evacuation, preparedness, and relief activities. Local

officials enlist relief volunteers, local law enforcement personnel, and military units[1] stationed nearby to disseminate warning and urge, or sometimes force, evacuation. Local officials indicated that radios were common enough, even in marginal populations, to give good dissemination of the warning, and that the extra personnel were used to insure that the warning was heard in all areas.

Positive reaction to the warning remains a problem. Evacuation is often seen as too much trouble and warnings are not always believed. In addition, marginal populations are reluctant to leave their homes for fear of looting or dispossession of land. In Orissa, an effort has been made to encourage people living in areas particularly susceptible to storm surge to move, but with little success.

Other Mitigation Programs

Many NGOs in the area have concentrated on encouraging populations in high risk areas to build strong, wind resistant houses which will withstand wind. Oxfam has experimented with the local construction of concrete poles for house frames. In higher areas where surges over two or three meters are not expected, the roof of a strong house would be used as a refuge from high water. The loss of housing in a storm is seen as a major setback to development and economic activity in the region. Indian officials cite the advantages of improving housing so that it survives a storm: reduction of relief burden on the state, avoidance of the diversion of development funds to relief, and assuring less devastation to the overall level of economic activity. In Andhra Pradesh, housing programs are the main activity in the disaster preparedness program. The state has created several training centers (Nirmithi Kendras) for disaster preparedness and storm proof building practices. The training centers hold seminars and field level demonstrations - primarily in improved construction techniques. The state also organizes disaster preparedness training sessions for administrators to discuss "socio-cultural and economic factors of cyclone affected areas" [AVS Reddy, 1992].

Other programs have also been implemented. Since 1977, the state governments coastal re-afforestation programs have been successful in re-foresting much of the Indian coast of the Bay of Bengal. Disaster officials cite the significant sheltering effects of trees and shrubs. Many raised mounds have been built to provide evacuation sites. In Orissa these are meant to provide evacuation primarily from riverain floods although mounds near the coast would also provide an evacuation site during a cyclonic surge. The mounds have no other use except informal grazing of animals.

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[1] Saffir-Simpson scale, see Appendix D.

F. Philippines

The Philippines is an island country that is often hit by typhoons, but topography makes it easy to walk to an area which is several meters above the probable surge level. Shelters to resist surge have not been a focus of government efforts. Recognizing that the best way to avoid large loss of life and economic disruption is to help the vulnerable population prepare themselves, the government of the Philippines has concentrated efforts on organization of communities (known as Barangays) - with training for administrators and Barangay leaders and awareness campaigns for the general populace. In the *Barangay Disaster Manual* (see Appendix A) a general framework and organizational structure is suggested for use in the creation of the Barangay Disaster Control Council. This community level preparedness and dependance on the Barangay leadership in developing plans for disasters has been effective in reducing losses in the various disasters to which the Philippines are prone. The Barangay emergency plan administrators have typically identified strong public and commercial buildings which can be used to shelter those members of the community without wind-proof housing. Often public structures are built with this in mind. In the wake of the destruction caused by the eruption of Mount Pinatubo in June and July 1991, reconstruction of public and commercial buildings is funded by the government only when the construction meets engineering criteria which would resist wind from typhoons and ashfall from volcanos. There have also been sporadic programs to encourage typhoon resistant house construction. The recent Core Shelter Program provides poor families with one typhoon resistant room and won a 1991 UN HABITAT Award.

G. Local Participation in the Planning and Implementation of Awareness Programs

A review of the major catastrophes during the Twentieth Century reveals the shortcomings of existing governmental structures to receive critical information from beneficiaries just when they need it most: when important decisions are being made following major disasters (The World Bank Environment Department, 1992). In the face of limited official resources and target populations which exceed the combined response capabilities of governments and development agencies, some international donors have undertaken programs to teach survival skills and pass on knowledge which either help vulnerable populations to better cope with their present circumstances or prepare them for future disasters.

Participatory approaches are most commonly used in programs dealing with storm- and earthquake-resistant housing, community awareness of dangers and precautions, disaster-

specific education, changes in land use and agricultural practices, distribution of emergency goods and services, population evacuation and temporary relocation facilities/camps. Following catastrophes, the evacuation of endangered zones and the construction of temporary living quarters for victims requires increased levels of participation.

In large-scale disasters, active participation by community organizations is the cornerstone of effective action. Citizen participation increases local leadership capacities, brings local perceptions of cost and value to proposed projects, and may make project outcomes more sustainable after outside funding ends. Pantelic notes that:

> Bringing the local community and its numerous resources into the center of the reconstruction planning and implementation process is a strategy that can materially contribute to the strengthening of a community... For example, Renovacion Habitacional Popular, the ground-breaking housing reconstruction program in Mexico City which provided almost 50,000 housing units, involved in the decision-making process the representatives of the concerned groups from the local communities in which the reconstruction was taking place, including neighborhood associations, tenement groups, and church organizations. (1990)

In a similar case, following the 1976 Guatemalan earthquake there were more than one million homeless in Guatemala City, several provincial capitals and their surrounding rural areas. Without mobilizing the population there was almost nothing the Government could do. The government of Guatemala organized local reconstruction committees to encourage and organize participation down to the neighborhood or village level. Many Guatemalans were able to learn about anti-seismic construction techniques which used locally available materials. In both Guatemala and Mexico, it was family-level decision making that determined whether or not local vulnerabilities to disaster were going to be lowered or raised.

III. Warning

The Existing System in Bangladesh

Detection, Classification and Initiating the Warnings

Responsibility for the detection, tracking, and the classification of cyclones lies with the Bangladesh Meteorological Department. The director, together with his staff makes the decision to issue warnings and predicts point of landfall when a cyclone approaches the Bangladesh coast. He relies on information from the Bangladesh Space Research and Remote Sensing Organization (SPARSO), and from the Department of Meteorology Radar stations located near the coast. SPARSO receives U.S. National Oceans and Atmospheric Administration satellite images every twelve hours and satellite images from the GMS more frequently. After considering all of the information from these sources, the director issues warnings within one hour of receiving the information. The regulations in the Bangladesh Government Cyclone Action Plan require him to issue the level 10 warning (the highest level) at least ten hours before the cyclone makes landfall. Mr. M.H.K. Chowdhury, the current director of the Bangladesh Meteorological Department, issued the level 10 warning seventeen hours before the April 1991 cyclone hit the Bangladesh coast. The ultimate responsibility for issuing the warnings lies with the director, who is not required to receive clearance from any other official in order to issue any warning.

The Bangladesh Meteorological Department contacts Radio Bangladesh, the Cyclone Preparedness Program (CPP) at the Bangladesh Red Crescent Dhaka headquarters, the Ministry of Relief, seaport and riverport offices, and the meteorological offices. The warning is announced over Radio Bangladesh (RB), and is passed to the Red Crescent/CPP subdistrict offices by HF radio. Radio Bangladesh broadcasts a variety of information to a number of audiences. According to Mr. Fakrul Islam, regional director of RB in Dhaka, RB broadcasts information on the position of the cyclone, wind speed, water levels, expected surges, and instructions to regional authorities from the ministry heads in Dhaka. Although RB normally goes off the air at 11:30 pm, and resumes broadcasting at 6:00 a.m., they stay on the air if there is a level 8 warning. If the warning goes to level 8 between 11:30 pm and 6:00 am, the meteorological Department will contact the Minister of Information to open the station and begin broadcast of the warning. Subdistrict offices contact union offices by VHF radio, and these offices notify the cells of ten volunteers in each village which pass the word by megaphone and other word-of-mouth means to the people in the villages.

The warning itself is a numerical system directed at sea and river ports. There are two systems: (1) a river port system which uses numbers from 1 to 4 and is meant to indicate both the direction of the wind and the speed of the wind, and (2) the seaport system which graduates warnings from 1 to 10, each number also indicates the location of the storm in relation to a given seaport and the storm's proximity to the port (and subsequently the degree of danger for various sizes of seacraft). In the seaport warning, the numbers 1 through 4 indicate different levels of caution for distant storms or small storms with windspeeds below gale force which are approaching the port. The numbers 5 through 7 indicate a stronger storm passing to the north, south, or very near to the port. The numbers 8, 9, and 10 all will indicate that a very destructive storm is approaching, but 8 and 9 indicate that the storm is expected to pass to the north or south of the port, while the number 10 indicates that the storm is to pass directly over the port. The intensity of the storm in levels 8, 9, and 10 is identical, but the position in relation to a specific seaport is different.

During the April 1991 cyclone, most aspects in the process of predicting the storm's path and passing the warnings down to the village level seemed to work reasonably well. At 0600 hours on April 29 the warning signal level 10 was issued for the Chittagong/Cox's Bazaar area. From all indications the transmission of the warning down to the union level was successful. RB begin broadcast of the warning soon after it was issued. Nevertheless, in many cases the warning did not result in people taking shelter or making a reasonable response to the incipient storm. The reports of the response to the storm [UNICEF 1991, BRAC, 1991] and the consultants experience and interviews in the field reveal a broad range of reasons that the warnings were not effective and the response to the imminent storm inadequate:

Warning Fatigue

In almost all groups interviewed by the consultants, and in all reports of the response to the storm, there are many people who did not move to a shelter or other safe area because they did not believe the warnings on the radio and relayed by the Red Crescent volunteers. Almost all cite many high level warnings in the past which were not followed by a severe storm as the main reason for failing to believe the warning this time. Warnings which are not followed by severe surge or wind are a consequence of two factors:

1. Erratic behavior of cyclones. The precise path of cyclones is extremely difficult to predict.

2. The safety margins built into the warning system. The Cyclone Action Plan requires the Department of Meteorology to predict landfall location and issue warning level 10 at least ten hours before landfall. This is done in order to allow CPP workers to reach the entire population at risk and allow enough time for remote populations to move to safety.

Given the erratic behavior of a cyclone, a prediction ten hours before landfall will be imprecise. Within ten hours of landfall the intensity of the storm can change, and it can change direction significantly. The path of a cyclone is dependent on a complex relationship between water temperature, ocean currants, high pressure and the barometric contours, the jet stream, and other factors not yet fully understood by science. The most sophisticated models for hurricane prediction available to the United States Hurricane Center vary as much as 160 nautical miles (296 km) when a hurricane is 590 km (or 30 to 40 hours) from possible landfall [Sheets, et.al., 1992]. Although the restricted area at the end of the Bay of Bengal should reduce the area of likely landfall, the erratic behavior of cyclones make error almost certain. In similar situations in the Gulf of Mexico, U.S. Hurricane Center officials expect a margin of error of as much as fifty miles (80 km) when they predict landfall for a hurricane which is 10 - 15 hours from landfall [Sheets, 1992]. And there have been at least six hurricanes in the Gulf of Mexico since 1920 for which prediction in a similar situation would have been inaccurate by 150 km or more. Over a 75 km area, a class four/five[2] storm - like the April 1991 storm - wind can vary from 225 - 75 km/hour and storm surge from one to seven meters. Thus, the predicted landfall and the predicted severity of the wind and surge can easily be inaccurate.

Factors which discourage moving from the home.

Fear of looting. Contributing to the unwillingness to believe warnings until the last minute is the fear that the few possessions which represent much of this populations wealth will be taken if the family leaves the home.

Lack of tenure. Squatters on newly accreted land feel that their hold on the land is lost if they leave. Some squatters are paid to occupy land by larger landowners seeking to make claim to the land. They are paid to stay and do not want to lose this income.

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[2] Saffir-Simpson scale. See appendix D.

Misconceptions About the Nature of Cyclones.

Several false beliefs led potential victims of the storm to disregard the warnings. Some believed that a severe storm would not come in the month of Baishak (the first month of the Bengali year)[BRAC, 1991]. Others (on the west side of the storm) felt the wind coming from the east or north, and did not believe the storm was coming from the sea.

Warning Comprehension Confusion

Reports and interviews indicate a generally accurate understanding of the warning system. Most of the high risk populace understand that the 10 level indicates the highest potential for destruction and most believe that 9 is less than 10, 8 less than 9, and so forth to 1 which is the lowest possibility of destructive weather. This understanding would serve the purpose of warning if the levels of 8, 9, and 10 are all considered indications of extremely dangerous weather and high tide. In some instances those who live nearer to a riverport than to a seaport may become confused since the highest riverport warning level is 4 (a relatively low number in the widely known 1 - 10 scale). Families who heard the warning go to 10, then later heard the riverport warning at 4 believed that the hazard level had dropped and that the cyclone danger had passed. One after-storm survey [UNICEF, 1991] reported that 16% of a sample on Kutubdia did not understand the warning.

No Warning Received

Two post-cyclone reports [UNICEF, 1991, BRAC, 1991] cites several cyclone victims interviewed on Kutubdia and three unions of Banshkhali Upazilla who did not receive the warning that a severe cyclone was imminent. One study cites poor transportation in the unions as the reason that warnings were not disseminated.

B. Increasing Warning Effectiveness

Reducing Warning Time

In order to refine the accuracy of the prediction and reduce the "safe" time which can be allowed between prediction and response, the system must have accurate and recent meteorological data and a streamlined communication process. The Department of Meteorology is capable of sophisticated analysis, has access to recent satellite images, and is given current meteorological data from the field stations. The chain of communication developed by the Red Crescent/CPP works well by all reports. However, the contingencies of the warning chain and response system below the union CPP radio are not reliable.

If the time needed to prepare for the storm could be reduced to, for example, five hours, then a more accurate prediction of the severity of the storm could be made, and the number of imprecise warnings could be reduced. In Bangladesh this is impossible for two reasons:

1. The systems for evacuation and response in the areas of vulnerability are extremely slow or do not exist. Where there is shelter it is often at a great distance over poor or non-existent roads. In most instances, evacuation should be several kilometers inland in order to escape the possible storm surge, and poor roadways make evacuation inland very slow and difficult. Fear of looting and other factors discussed below hold people at their homes until the last minute. Radios are uncommon in the poor coastal areas, and word-of-mouth is an inconsistent method of covering a community, particularly with the transient populations common in the high-risk areas.
2. When a class four/five cyclone (like the April 30, 1990 cyclone) is ten hours from landfall, the vulnerable areas in the path of the eye can expect to receive gale force winds (89 km/hour) and two meter seas within four hours. Any significant evacuation after this is difficult. Disaster officials in the Caribbean consider any outside activity by their staff within five hours of landfall to be extremely dangerous. The advent of the storm surge will be one or more hours before landfall. Thus, the warning that a cyclone will strike land in ten hours really only represents four or five hours of preparation time. The disaster coordinators of the Virgin Islands begin preparations for a hurricane forty hours before landfall. The standard recommended by the U.S. Hurricane Center is to begin rapid evacuation fifteen hours before landfall - more time is required if the evacuation must be conducted during the night.

The time for response can not be shortened if the marginal populations in the undeveloped areas on the coast are to have time to make an effective response to the coming storm. Until issues of infrastructure and economic conditions which prevent effective response by the vulnerable populations are addressed, the margin of safety produced by the early prediction will be necessary. Initial preparation for the storm by local Red Crescent officials and storm shelter mangers should begin thirty hours before a possible storm in order to give them at least twelve hours of daylight. The problem of warning fatigue has no easy solution in this situation. Imprecise predictions are inherent in the nature of storm and slowness of the response system. And an exceptionally early warning is necessary for the required margin of safety. This insures that sometimes warnings will not be followed by destructive wind and storm surge. The problem of warning fatigue must be addressed with awareness campaigns directed at increasing

understanding of the nature of cyclones, maintaining appreciation for their potential destructiveness, an acceptance by the at-risk population of imprecise prediction, understanding for the necessity of evacuation, improved infrastructure for evacuation, and a reduction of the risks associated with leaving the home. These solutions are discussed further in the following section on awareness and shelter management. The issue of night-evacuations is also discussed in that section.

Reducing Confusion on Warning Signals

The signals used for warning seem to serve the purpose of alerting the populace in a general way, except for the confusion caused by the difference between the riverport warning system and the seaport warning system. There is also indication of some other unspecified general confusion [UNICEF,1991]. In most countries in the western hemisphere as well as many other parts of the world the Saffir-Simpson scale (Appendix D) is used as a basis for information disseminated on hurricanes and typhoons. The scale itself is only a classification of storms by wind-speed and potential destructiveness. The classification is combined with the location of the cyclone and predicted path of the storm to inform local officials in their decisions on preparation. Local weather bureaus typically use a phrasal hierarchy to announce the potential danger of a storm. In the U.S. the phrases, "Hurricane Advisory", Hurricane Watch", and "Hurricane Warning" suggest to the public the increasing potential for reaction or evacuation. An "Advisory" is issued when there is a hurricane anywhere in the western Atlantic. When the hurricane center is within a possible 36 hours of landfall (or more than 36 hours if it a large hurricane or traveling exceptionally fast) a "Watch" is broadcast for those areas of possible landfall. Depending on the size and speed, a "Warning" is issued when the storm is within 24 hours of landfall. A "Watch" or "Warning" may be broadcast when the storm is even farther than suggested above if the area of possible landfall is particularly vulnerable and will require longer for preparation or evacuation (eg. the Florida Keys). The public is advised of the exact areas which are in danger of severe weather through broadcasts over the television and radio. The media also broadcasts suggested precautions. A local government emergency official is responsible for deciding whether the storm is likely to make landfall close enough to require evacuation of the coastal areas. Evacuation orders are issued over the radio, television, and by loudspeaker announcement in endangered communities. In this system the public does not have to remember the relationships between numbers and dangers. The degree of imminent danger is communicated clearly in direct language. Many developing countries use a similar system, but have developed awareness campaigns which associate a level with understandable consequences. For

instance, island nations of the South Pacific receive similar warnings from Hawaii or Australia.

A phrasal system which is clear and concise is preferable to one which requires interpretation. Sea and river craft warning systems can be maintained, but it should be made clear in announcing them that they are for boats only, and be followed immediately by warnings for the public in clear language, addressing specific areas and specifying the anticipated degree of danger (wind and surge). Warnings should quite clearly spell out the consequences of failure to evacuate and take shelter so that it is more difficult to casually dismiss them. Warnings should be issued for each affected upazilla.

Warnings should also include suggestions for dealing with the coming destruction such as reminders to take a small amount of food and water to the shelter, taking money, burying or securing other belongings, particularly the tools needed to resume income producing activity. In the rush of evacuation, especially if the evacuation is delayed, reminders such as these can help cushion the after-storm impact.

However better a phrasal warning system is, any change in the current system must occur gradually to assure that confusion is not increased, especially during critical periods when a storm may be close. Any change in the warning system should be preceded by an extensive public awareness campaign to assure that the affected population understands the new system.

Assuring Maximum Warning Dissemination

The Red Crescent/CPP warning mechanism worked well by all reports. Nevertheless, some surveys and reports point to people who did not receive the warnings - people who existed on the seams of the system and were not reached, or who were victims of occasional breakdowns in the system. In most cases there is a large ratio of people to be warned to volunteers, and thus the coverage expected form the number of volunteers available has to be very good for the system to work. There is little overlap built into the system or contingency plans for when a volunteer is disabled, unavailable, or for other breakdowns in the system at the village volunteer level. Redundancy, which is wasteful and unwanted in most situations, is necessary here for the system to insure that the warning is out to all possible victims.

Two processes will expand the system to insure coverage:

1. Determine the gaps in the existing system. The CPP must undertake an extensive inventory of the areas at risk and the teams which are in the system in order to expose the areas which are not covered by a CPP team. Discrepancies can easily exist between the area which the CPP headquarters expects a team to cover and the area which is actually covered. Each ten member team should indicate what

is the area that they are able to effectively warn in a three hour period, and this information should be passed back up to the office making the coverage inventory.

2. Expand the personnel resources available for warning. If resources allow it, the CPP cells at the village level could be expanded. Other organizations could be brought into the system. The Ansar VDP is an organization whose character would make it an logical choice for this task. The consultants were told that an informal association between the CPP and the VDP in times of emergency exists all ready in some upazillas. In may be necessary to formalize this arrangement to insure that all areas are covered and too much redundancy does not leave some areas unassigned. Local NGOs with staff in the area may also be enlisted. If other organizations are brought into the system, there will be an acute need for clear coordination. It should be clear who is in charge of coordination at the upazilla level. Bringing the VDPs into formal cooperation with the CPP will clearly require some inter-ministerial agreements. But this sort of cooperation is almost always relied on in other countries to provide the rapid increase in resources needed in such emergency situations.

   The expansion of the system to include the VDP or NGOs will also have the advantage of increasing communication resources, even if this means that only more transistor radios are available. The CPP in each area should identify radios in the area and enlist the owners in the warning dissemination system. Volunteers could rely on these radios to update their own information or as an alternative source if their own source of communication is disrupted.

Simply increasing coordination between the various resource groups in the areas should result in significantly better dissemination of the warning.

Addressing Fear of Evacuation

In all societies it is a challenging task to motivate the coastal populace to respond to warnings which occur each year but which are valid as seldom as once every twenty years. It is particularly difficult when socio-economic conditions make leaving the home tantamount to giving up a life's work. The fear of losing possessions, land, or employment all contribute to the general ineffectiveness of warnings. These are issues which are not warning problems in a strict sense, but are problems inherent in the poverty and socio-economic conditions of the high-risk areas of Bangladesh. They are problems which can be addressed by better community organization and awareness, and are discussed in those sections below.

IV. Approaching Relief Through Capacity Analysis

A recent book which summarized the findings of a five-year Harvard University study of disaster relief, *Rising From the Ashes*, (Anderson and Woodrow, 1989) suggests two key definitions and a framework in which to use them.

1. *Disaster* is an acute crisis or event which outstrips the capacity of a society to cope with it.
2. *Development* is a process through which people's vulnerability (economic, social, political) is reduced.

Anderson and Woodrow worked with these two concepts to develop an analytical framework that provides a system for determining which factors are of critical importance in the design and evaluation of relief projects. The authors define vulnerability as: "the long-term factors which affect the ability of a community to respond to events or which make it susceptible to calamities." They expand on the notion of development by insisting that to increase capacities is as developmental as to reduce vulnerabilities.

In the Multipurpose Cyclone Shelter Project, it might be helpful to frame our goals in terms of these two related concepts, keeping in mind that it is both easier and quicker to increase capacities than to reduce vulnerabilities. Any proposed intervention on the coast of Bangladesh must be approached in terms of how will it increase local capacities and/or reduce local vulnerabilities. Before looking at what people in the High Risk Zone need, it is important to know what they already have, and what can they provide for themselves. It is only after their capacities are assessed that their needs can be considered in a constructive manner.

The Harvard study found that in many disaster relief interventions, staff set goals which limited the effectiveness of their work. These were primarily instances where the relief efforts concentrated only on the physical and material consequences of disaster. Anderson and Woodrow and their colleagues at the International Relief Development Project (IRDP) showed that rather than restoring material possessions, in terms of final outcome, it was usually more significant whether the relief interventions weakened or strengthened: a) the attitude that the victim community had about its own ability to create change, and b) its social/organizational structure.

Vulnerable populations are often so poor that intervenors feel required to regulate the victims' conduct and provide for immediate needs in order to ensure their survival. When survival is no longer an issue, such conduct becomes inappropriate. After looking at the results of about 50 previously completed projects, Anderson and Woodrow became

convinced that inappropriately paternalistic responses could harm the victim/beneficiary communities psychologically. Anderson and Woodrow (1988) point out that:

> Every society has both strengths and weaknesses, capacities and vulnerabilities. When a crisis event becomes a disaster - i.e., it outstrips the capacity of the society to cope with it--then the society's vulnerabilities are more noticeable than its capacities. However, for agencies wanting to help with recovery and systemic development beyond recovery, understanding both is essential. Not all crises become disasters and not all people suffer equally from any given disaster. Why do disasters occur where and when they do, and why do they happen to some people and not to others? The answer lies in an examination of vulnerability. People become disaster victims because they are vulnerable.

As outlined earlier in this report, vulnerabilities can take many forms. Where possible it is important to address the physical and developmental vulnerabilities: the lack of food and shelter, poorly built or located housing, ethnic or social divisions, poverty, and risks posed by geography and climate. Sometimes it is more important, and easier, to address motivational vulnerabilities. Motivational vulnerabilities reflect the way the community sees itself and its choices for dealing with its physical and social environment. Fatalism, reliance on an employer or spouse to make key decisions, the belief that the disaster is divine retribution, and the need to protect belongings or livelihood contribute to motivational vulnerability.

It is within this context that our recommendations underscore the importance of building upon capacities. Although the people along the coast of Bangladesh are some of the poorest people in the world, their vulnerability was not homogenous during the last cyclone. Most people interviewed commented that the communities which had been established for a longer time, where people knew each other and there was a tradition of work and trust, had survival rates much higher than surrounding communities which did not enjoy these advantages. The preparedness and organization provided by the CPP played an important part in the overall reduction of fatalities. This is a crucial fact for relief intervenors to bear in mind. There is no handout or subsidy which an NGO can give to the disaster victims which can reduce their vulnerability to the degree possible by increasing their social and motivational capacities. The weight of poverty and the habits formed from years of non-participation and powerlessness makes the task of increasing organizational capacity in poor communities difficult, particularly when there are few resources for programs or immediate material rewards for participation. Yet, the factors which will encourage successful warning and shelter management systems are closely tied to developing these capacities.

V. Awareness

Awareness programs prepare the citizens of disaster-prone areas for disaster by teaching them, or those charged with their welfare, how to cope with the risks associated with the particular mix of natural hazards which they are likely to face.

Each disaster event is unique, and educational needs vary according to a complex set of variables that include prior calamities, age, gender, social organization, and internal conflicts of the victims, as well as the social and political context of the country in which they are located (McGinn, 1985).

Almost all disasters provide an educational window of opportunity. In the coastal areas of Bangladesh as in all communities which have had to cope with disasters, the circumstances into which people are thrown following a major catastrophe motivate the victims to learn new lessons in health, nutrition, and child care if their family is to survive the next similar event and its immediate aftermath. More importantly, families begin developing a new complex of survival skill and coping mechanisms. This is a process which intervenors can never control but can facilitate, or cripple, if not handled sensitively.

A. The Role of Participation

Bamberger (1988) defined community participation as follows: "In the context of development, *community participation* refers to an active process whereby beneficiaries influence the direction and execution of development projects rather than merely receive a share of project benefits." On a very fundamental level, reducing disaster vulnerability in coastal Bangladesh requires the active involvement of millions of families in their own development process. Large numbers of individuals can only be reached by extension/outreach programs if they are brought together in groups, and the groups are permitted to work together to solve common problems.

Community awareness is increasingly perceived as the most important but least understood aspect of disaster mitigation. In the face of limited official resources and victim needs which exceed the response capabilities of relief and development agencies, governments and NGOs need to undertake programs which teach certain skills and pass on bodies of knowledge which either help disaster victims to better cope with their present circumstances or prepare them for a foreseeable and fairly immediate future disaster.

Community participation increases local leadership capacities, imposes local perceptions of cost and value upon proposed projects, and may make project outcomes more sustainable after donor funding is withdrawn. Whenever paternalistic relief distributions are allowed to continue for too long, getting people to make independent preparations becomes more difficult. Whether or not the government, NGOs and local authorities can break the patterns

laid down in the relief effort following the April cyclone will determine to what degree there are going to be long-term reductions or devastating increases in vulnerability.

B. Community Level Courses

In Bangladesh, some agencies may have tended to concentrate on community awareness on a grand scale and at the higher bureaucratic levels, ignoring the micro-scale neighborhood and community levels on which it must actually be dealt. For example, the various NGOs that the consultants visited had training planned for local officials and their own volunteers, but they tended to leave the average local villagers out of their comprehensive training schemes. Short, (half-day) disaster awareness/mitigation courses aimed at the general public have been effective. The courses explain what cyclones are, how to protect housing from wind and surge, shelter and evacuation procedures, other emergency measures. Awareness program curriculum development is discussed in greater detail in another section.

In the Caribbean the various island governments promote what they call Face-to-Face talks. These were courses given on the village level to virtually everyone. As local government officials and NGO staff receive training, they should be trained how to train others. Assistance in the design of rudimentary training materials and simple demonstration models should be an integral part of the training.

Ultimately reducing vulnerability rests on local perceptions and understandings regarding the nature of the hazard which they face, and how these perceptions inform their decisions in the face of the storm-caused risks which confront the family. These understandings are based on whatever level of knowledge the family possesses, and family capacities can only be upgraded through attempts to tailor the educational message to the existing knowledge level. The sharing of experiences, particularly of successful approaches, between regional committees and individual promoters on the local level will be essential.

C. Two-Way Communication

In addition to participation, increasing community awareness will also require effective communication with those groups who will be asked to modify their actions. In the developed environment of coastal Bangladesh, reducing coastal vulnerability will only happen slowly. Intervenors need to prioritize among the many changes they would like to see. Concentrating only on one or two mitigation measures every year greatly raises the likelihood of a proposed innovation being accepted. An experienced program manager once told us: "Outreach programs can teach one thing to a hundred persons, or a hundred things to one person."

Achieving truly dramatic increases in the resiliency of the coastal population will ultimately require that millions of poor families make fundamental changes in many aspects of their daily life: in the manner in which they construct embankments to protect their community; in the siting and construction styles with which they build their homes; in the techniques they use to work their land, fish, tend their animals and plant their crops; and even in the way they gather firewood. These families have to be consulted about the options and alternatives from which they will be asked to select.

Two-way communication with vulnerable populations on the topic of common practices which contribute to vulnerability is an activity with which governments often have little experience. In developing countries where large populations survive outside the formal economy, little improvement over the long-term can be made in their situation without deliberately opening new channels of communication between government and disaster-prone populations.

In most countries, coastal people do not fully understand what a cyclone is. Their educational awareness needs can only be fully addressed by programs that have taken the time to figure our what it is that they think is going on when a storm hits the shore.

D. Staffing

Any examination of the vulnerability of coastal areas needs to address the question: who will the most effective intervenors be if we want the resiliency of the potential victim community be increased? The most effective strategy is an approach which integrates the potential or actual victim community into the field staff of the awareness program which is striving to increase community awareness and promote damage mitigation. Thousands of individuals and families in far-distant rural areas are the decision-makers whose action in critical areas will raise or lower their own vulnerability. Sending in promoters and extensionists to whom they cannot relate will not result in a significant learning experience.

The people best able to communicate with vulnerable villagers are usually their neighbors. Care should be taken to ensure that outsiders do not dominate the awareness process. Local people will be in the area during the evenings and holidays when outsiders would insist on time off. They use the same vocabulary, and their testimony regarding what they have seen elsewhere will be believed. Who the field implementers are is as important as the curriculum to be taught and the nature of their commitment. Awareness programs are often successful to the degree that the extensionist/community organizer shares characteristics with the beneficiaries.

A community organizer who is similar to and representative of the beneficiaries makes the clear statement that a program is committed to helping the community help itself. If and when the funding stops, the extensionist who lives locally will remain in the community and

continue to be a source of information on emergency preparedness. The lower a community's self-esteem, the more they will refuse to believe that one of their neighbors has something to teach them. However, when they discover that he really did have important things to share, the increase in local capacities will be correspondingly greater.

E. Awareness/Emergency Preparedness Activities

Studies which have mapped the areas where natural hazards are prevalent have shown that the same types of disaster strike the same countries repeatedly. Coastal Bangladesh faces severe cyclones every year. Some sectors of the population are more vulnerable than others. It is necessary to disaggregate the vulnerable population in order to identify groups which require special attention.

Along the Bay of Bengal, vulnerability has physical, social and attitudinal dimensions. Physical vulnerabilities include lack of access to shelter, living beyond the embankment, living in low-lying areas, and housing which is not wind-resistant. Social vulnerabilities include lack of a sense of community (in recently settled villages), a pattern of destructive competition between individuals and families, and the relationship patterns between men and women (which no longer work as they did before because of the advent of new technologies or productive activities). Such is the case when, for example, men decide when women cannot leave the home, but then the men go off to work in distant cities. The cultural pattern only works when men are in the home to make these life-or-death decisions.

On the coast, the government can improve Civil Defense procedures, and the warning system but preventing settlement in the emerging chars (newly accredited islands) will require that families opt to live elsewhere. Influencing this family-level decision requires more than standard bureaucratic action. Mitigating the next disaster will require that coastal families change dangerous practices in areas too remote for the government to supervise. This will only happen when they understand the nature of the risks that they face, and discover alternatives which are acceptable to them. Addressing awareness of problems and creating mechanisms to address the problems are the objectives of a participatory, community-based awareness campaign. In addition, programmatic and bureaucratic measures are sometimes called for and special needs of certain sectors of the population must be taken into account.

Temporary Residents

In the High Risk Zone there is usually a large migrant population during cyclone season. During the many interviews which the consultants conducted, it was often commented that these people did not know the area, and consequently could not find their way to the shelters. It could be assumed that in many cases they did not

even know of the existence of shelter. Dealing with these people was not assigned to anyone as a direct responsibility and therefore nothing was done. This is the type of problem which is uncovered during the preparation of an emergency plan. (See the section on Shelter Management for further discussion).

Storage

A fear of looters and a corresponding loss of material possessions was cited by many volunteers as the main reason why families remained in their homes until they blew away. This certainly indicates the advisability of incorporating some sort of mechanisms for securing possessions near the shelter. Of course, possessions cannot be allowed in the shelters themselves lest they occupy space which humans might need.

Religion/Custom

Religious leaders must be given a role in any awareness campaign. Religious traditions which emphasize preparation and self-reliance can be important tools in a traditional rural culture.

If there are religious dictates regarding the mixing of sexes and loss of purity, these must be taken into account in the local plan. Additionally, a more causal and appropriate emergency attire for women should be discussed with village imams.

Income Generation

Very often people are vulnerable because their poverty forces them to take risks with their own survival. While it is important to remember that increasing organizational capacities and changing attitudes can translate into a reduction in vulnerability, income generation projects which increase families' economic capacity often result in their finding safer alternatives for themselves.

F. The Use of Incentives to Promote Mitigation

Promoting sustainable changes involves the intelligent use of incentives. Governments in many countries inadvertently reward their citizens for contributing to the sorts of environmental degradation that increase their vulnerability to natural hazards. In some countries traditional peoples who lived in harmony with nature in jungle areas have lost their land because they did not "improve" it by bringing it under inappropriate slash and burn cultivation. Other nations have subsidized logging on eroded hillsides. Promoting shrimp farming with technologies which damage the protective mangroves is a prime example of letting capital city priorities increase rural vulnerability.

Getting the right message out before disaster strikes is often an important disaster-related consideration. Unfortunately, there are circumstances where habits are so ingrained that little can be done to start turning things around until a disaster happens. Disaster are tragedies, but agencies can make them even more tragic if once-in-a-lifetime opportunities to for productive use of incentive are lost.

After a catastrophe there is usually a window of opportunity to promote improved practices and to begin changing harmful or dangerous national habits. As the relationship between what is done to the environment and the occurrence of natural disaster becomes more clear, it has become apparent that in addition to educational programs, governments need to tailor incentives in such a way that target populations will have some reason to act in the way their governments would like them to. Relief and reconstruction projects should be designed and implemented so that they communicate the right message to disaster victims, and thereby reduce future disaster vulnerability.

G. Defining Target Populations

For the purpose of community awareness, it is not sufficient to divide the coastal populations into High Risk Zones and Risk Zones. It is equally important to take into account their past experience. Consequently, the vulnerable population must be further divided into at least two additional categories: 1) those that have seen and still remember cyclone devastation, and 2) those that have not. Each of the two sectors present a different challenge.

The cornerstone of the vulnerability reduction process is to help the victims of a disaster to make sense out of their experience and to identify lessons learned. In cyclones (as in most kinds of disaster) one of the basic challenges is to help people who have been through the process to reflect upon it and to make sense of their experience. For example, one of the things that INTERTECT regularly does following a disaster which has devastated housing is to organize the survivors in a walking tour of their village, and encouraging them to begin making sense of why some houses stood and others failed. While because of our past experience INTERTECT staff often know all too well what the answers will be, the important thing is for the disaster victims to realize that there is a pattern to the destruction. The victims need to understand that they are capable of seeing what that pattern is. Once that happens, almost invariably they will realize that there are certain measures which they can take without outside assistance so that the next similar event does not have as drastic an impact. The people who survived the surge should be asked what they think can be done the next time to reduce the high rates of mortality.

In the area that actually experienced high waters, the most important activity is to document the way that people remember the event for posterity. One way this is done is

to get as many members of the community as possible together (ideally as part of the community-level, face-to-face courses discussed below) and to have the facilitator provoke a discussion about the highest level which the storm waters reached. Brightly colored high water lines are painted on a public building and the date written will serve as a reminder of the devastation and help guarantee an oral history of the event. Although many in the village will say that it is not necessary to paint the line, and that they will never forget how high the water got, this is not true. Two years from now there will no longer be agreement, and five years from now most people will have forgotten. But if the high water lines are there for all to see, and the members of the community believe that the lines reflect their perception of the event, the awareness of the community will remain vastly higher than it otherwise would have been, and it will never drop as low as it otherwise have done--no matter how many years pass until the next cyclone.

As we shall review below, there are a number of ways to keep awareness high where it already is high. The task where there has been no cyclone damage is to create disaster awareness without having to experience the disaster. One of the best ways is to arrange for particularly articulate victims (of the same social level and economic group as the target population) to visit the disaster-stricken communities to tell people what they heard and saw. Vivid stories of the experiences of victims can be spread through comics newspapers, as well as simple storytelling. Photos, films, newspaper pictures can all be used in awareness building courses. An adventure story about successfully surviving the disaster is an effective tool among children.

I. Curriculum

Awareness programs require the willing participation of the learner. No one can unilaterally "develop" anyone else. Reducing the vulnerability of coastal populations will require teaching vast numbers of people whose level of awareness varies. In *Human Settlements and Disasters*, Davis highlights this aspect of the post-disaster awareness endeavor, "It is vital that designers know how far a local community is aware of any risk, and also what priority they attach to such hazards". [Davis, 1980].

Once the technical information to be taught has been identified, getting the information to the people that need it is the responsibility of the local promoter/extensionist. INTERTECT recommends the creation of an Emergency Coordinating Council in every village (see section on Shelter Management). The ECC or some other group which is made up primarily of members of the community will provide the first plenum for information dissemination and other activities.

Determining what is to be taught is going to be crucial. Most government agencies are used to deciding upon curricula in a fairly paternalistic manner. Raising the awareness of

the busy adults whose actions and decisions we are trying to influence requires finding out what sort of message they are going to be willing to listen to. As mentioned before, it is important to place considerable emphasis on techniques which can be absorbed passively - posters, stories told at community events, high water marks on shelters, and others.

Community Awareness curricula needs to do the following:

* Identify the types and combinations of threats which face each particular community.
* Classify the composition and idiosyncracies of the various neighborhoods and villages, identify target populations according to per capita needs.
* Describe prevention linkages between the environment and natural disaster. Clarify the role of natural coastal defenses in creating a safer living environment.
* Provide the additional financial support required for environmental projects aimed at recovery (like polder conservation/improvement and mangrove reforestation)
* Establish a regional network which exchanges data and identifies the awareness measures which are being best accepted by the people in the High Risk Zone.
* Educate the population on how to respond to early and credible warnings on potential disaster situations.
* Search for meaningful explanations. Char dwellers may be more interested in learning that fishing will be more profitable, safer and easier when the mangroves return than they will in hearing about their ability to hold soil and fight surge.

Developing Public Awareness Materials

Effective communication of some of the preparedness measures which would be accessible to the coastal communities is essential to reducing their vulnerability. In conjunction with a program to improved building techniques in seismic zone of India, INTERTECT developed guidelines for creating visual aids. The guidelines are based upon responses to the tests conducted in villages in West Bengal, Rajasthan, Bihar, Himachal Pradesh, Uttar Pradesh, Gujarat, Maharashtra, and Jammu & Kashmir. Even in regions with the lowest literacy levels and little exposure to other forms of communication -- television, advertising, magazines, etc. - it was found that villagers could comprehend the drawings and understand the message.

Similar tests have been conducted in other parts of the world as a means of determining how technical information can be relayed successfully to uneducated villagers. In all cases, this testing procedure has led to the development of training aids that do not require reading skills or any particular building knowledge. Hence, the training aids can be used not only by tradesmen, but also by village youth, women and even children as a means of stimulating interest to promote change.

A test booklet used in the villages determines how and what the people can understand in pictures. It cannot be assumed that what an educated person sees in an illustration is also understood by an uneducated person. For example, a house shown in perspective may be interpreted as a building with walls that become smaller near the corners. Or a detail out of context may be seen as a totally unrelated object. Abstract symbols, such as arrows or directional lines, might be viewed as objects of religious significance or telephone wires. The artistic rendering of detail can also be misinterpreted: what is illustrated as a thatched roof may be seen as wood or C.G.I. sheeting. Hence, it is essential that any pictures used in charts, booklets or films be developed in accordance with the following guidelines:

(a) Size of Drawing: If too large, the drawing cannot be seen as a whole. If too small, it cannot be interpreted at all. Illustrations should be scaled to a comfortable reading size, keeping in mind the distance from which the pictures will be viewed.

(b) Perspective: 2-dimensional drawings are often more easily understood than 3-dimensional. Drawings should show perspective according to what a person normally sees. For example , the drawing of a village as seen from a nearby hill may be correctly interpreted, whereas an aerial perspective of structures would be misleading and should be used only when necessary.

(c) Shading and Coloring: Certain colors have traditional significance that will distract from the message of the visual. Colors should be selected within the appropriate cultural context or, better yet, extension agents/ instructors from the local population might be encouraged to "color" teaching aids themselves. Whenever used, color should not distract from the main message of the drawing.

Shading can help to identify an object or person as a solid form, thus clarifying lines that might otherwise be confusing. Skin tone is important in helping local viewers to identify persons depicted in drawings as belonging to their own racial/ethnic group.

Care must be taken that shaded or colored areas are not interpreted as whole objects, rather than merely the enhancement of an object.

(d) Symbols: For example, arrows, dotted lines, wind lines, X's, check marks and directional indicators often are misunderstood or are interpreted as religious symbols, telephone poles, appendages of the illustration in point, or as other unrelated objects. These are best avoided unless dealing with a more educated community.

(e) Details: Details out of context are often totally misinterpreted. For example, a drawing depicting the enlargement of a foundation footing may be seen as a multi-story building, a train, etc., or may not be comprehended at all. If possible, details should be shown within the context of the larger picture or as whole objects.

For example, a person with part of the head cropped off will be distracting to a villager; a disembodied hand may be difficult to identify.

(f) Background: Backgrounds should be eliminated or simplified as much as possible. Drawings and photographs should include only such background details which would encourage recognition of the subjects depicted or which would place the subjects in the appropriate cultural context.

(g) Sequencing of Images: People unaccustomed to reading often have difficulty making the mental connection from one image to another. For example, if attempting to show what happens to a house during a cyclone, it is best to show the destruction of the house in stages. A picture of the house immediately followed by a picture of the collapsed structure is often seen as two totally unrelated structures and the message is lost.

(h) Style: Clarity of drawing style is important. Too many details tend to confuse, while too few details create ambiguities. It has been found that simple line drawings which carry only the essential information are most effective. For example, if showing the plastering of a wall, emphasis should be placed on the activity of plastering and on the plaster, rather than on the wall details or other components.

(i) Story Line: Creation of a story line is extremely effective, especially when developing training booklets. A simple chronology of events can show the steps to be followed for preparing for a storm. People respond very well to information conveyed through stories and generally retain the information longer when presented in this format. This implies the use of a character or characters throughout the booklet who, through their actions, show how to prepare for a storm.

(j) Text: If desired, a simple text in the local dialect can be added to enhance the story for those who do read, yet all necessary information should be conveyed by the drawings alone. The text should focus on essentials only. It should reinforce the key message contained in the drawings or photos. Bold, uppercase lettering is more easily comprehended than small, typed texts.

(k) Cultural Conformity: Drawings are generally viewed fairly literally. Hence, if a housing style or detail does not conform to the conventions of a particular region, villagers may respond with, "We don't have that kind of house here" or "We don't do <u>that</u> here", and the message will be lost. For example, in Indian test for housing improvement drawings, a drawing which depicted a structural framing technique in Andhra Pradesh was seen as a rest house in the northern tea estate

areas of West Bengal. It is recommended that, whenever possible, training aids be prepared with attention to regional and cultural differences.

Understandably, in a country where language and literacy levels vary from region to region, the most effective means of communication is through on-site demonstrations, dialogue and visual aids. Radio, television and film can augment a program if the means and economics exist. It is imperative that these be prepared with a sensitivity co local customs, level of skill and language.

Teachers' Instructional Booklet:

This should be created as a supplement to the cartoon booklet, providing technical background for teachers or extension workers. A more cost-effective means would be to print the explanation or technical information for teachers below the drawings or on the facing pages.

Posters:

Posters or flyers displayed in public places in the village can stimulate interest in a program. A popular film actor or cartoon hero could be utilized to describe emergency preparations. These should be prepared using guidelines suggested in the section on testing booklets. Posters should also indicate where interested parties can obtain more information.

Mobile Teaching Units.

These could be used to bring the film and other information to villagers. Based on the "village theater" form of entertainment, the mobile unit could serve as an entertaining and effective means of creating awareness and distributing materials in rural areas.

Exhibitions and Trade Fairs:

These are also very popular with villagers and present an opportunity to reach a wide audience, as these events are well attended. Films can be shown, booklets or flyers distributed and information on cyclones and vulnerability reduction provided. Charts and diagrams showing how a cyclone affects housing, and information on various modifications, should be prepared using the same guidelines explained in the section on training booklets.

When preparing an exhibition, it is important to remember that the majority of viewers cannot read and that the effectiveness of the display will closely related to the degree in which it communicates through pictures or, better yet, realistic models.

Throughout the training and implementation process, materials and programs should be evaluated for their effectiveness. Villagers should be questioned for responses to films, radio announcements and posters, and levels of acceptance should be considered. It is

understandable that a program of this scale will take years before its impact is felt. However, if these recommendations are followed, public awareness of cyclone risk should be heightened and hopefully the necessary steps for reducing that risk will result. Cooperation between technical and research organizations, state governments, voluntary agencies and local leaders will have a major impact on the program's effectiveness.

Appendix A and B includes materials which can be used as a guide for NGOs, and the ECC in developing programs for emergency preparedness in the community.

Improving Buildings

The housing sector is too often the subject of unenforceable regulations which aim to reduce disaster vulnerability without fully considering the needs and means of the beneficiary population. Of all the techniques which improve the performance of structures in the face of storms and earthquakes, the most effective is often to generally upgrade the skills and qualifications of local builders (Pantelic, 1990).

Housing Education

One area where the resources of the vulnerable population could be conserved is their housing. Particularly in the areas where high waters will not always be a problem, some attention should be given to make housing more wind-resistant. This is one of the most common post-disaster educational opportunities, and an area where there is a large body of knowledge. Examples of safe housing educational materials for cyclone areas have been included in Appendix B of this report. The Office of Foreign Disaster Assistance (OFDA) of the Agency for International Development, the coordinator of all U.S. government-funded relief programs, notes the following:

> The term "housing education" refers to the provision of technical assistance to homeowners and building tradesmen on ways to improve traditional housing to make it more disaster resistant. Housing education may be a teaching and education effort alone or may be a component of one of the options mentioned herein...Housing education programs are difficult to initiate and conduct as the training staff must be familiar with not only the technical aspects of construction, but with means of conveying the information to different groups of people...As difficult as housing education programs are, without some post-disaster program in this field, long-term acceptance of disaster-resistant construction methods is not likely to take place (OFDA, 1981, p.72).

Houses can also be made storm-resistant through housing education programs. Just changing the angle (pitch) of the roof costs little or nothing, but can save homes from massive cyclone/storm damage (Reps and Simiu, 1974; OFDA, 1981; INTERTECT, 1981;

Hammet and Hurrel, 1984). The Governments of India, the Dominican Republic, Madagascar, and the Solomon Islands, have education/hazard awareness efforts directed towards this end.

The programming options can be reviewed for particular locations in particular nations or regions as the social and economic design problem post-disaster for a particular place has been defined. The criteria of definition are extended by the determinants of earthquake and cyclone resistant design and planning for flood damage reduction. Disaster risks are greatly reduced by the selection of relatively risk-free sites and by pursuing layout patterns which also reduce the risk. Once these two requirements are satisfied, attention focuses upon the achievement of safe housing structures. (OFDA, 1981, p. 67).

Over time the accretion of land and improvement of the polder structure should lead to reduced vulnerability for some of the lands from tidal surge. NGOs and government organizations working in the flood plain should not wait until then to deal with the problems posed by storm winds. Including housing education in the broader awareness program will slowly lead to those long-term changes in construction techniques can ensure the safety of residents in the cyclone-prone areas.

After a significant percentage of the housing stock has been destroyed, disaster victims are already highly motivated to rebuild their homes in a more disaster-resistant manner. If training in safer and low-cost construction techniques is provided to builders in the first days after a disaster before the rebuilding process actually begins, people who employ builders subsequently will wind up with safer homes almost automatically. New regulations and improved technology may be almost inseparable from training for key individuals within target populations.

Evacuation

One benefit of the April 1991 cyclone is that public awareness of the dangers posed by cyclones to shoreline communities is currently at an all-time high. The INTERTECT team asked in several communities about local behavior in the much milder June cyclone which followed. We were told that, for the first time, cyclone shelters filled up at an early stage of warning, and that more families than ever before fled the coast for higher ground.

The current level of cyclone awareness represents an opportunity. Reducing the vulnerability of low-lying villages will be easier as long as the memory of April 1991 remains fresh. Conversely, over time if nothing is done to take advantage of, and to build upon the existing level of concern, a very valuable opportunity will be lost.

School Children

Even within small villages it is necessary to disaggregate the population and to direct special awareness programs towards sub-groups within the community. One group which must be reached to reduce vulnerability over the longer-term is the school-age population. Teachers should be supplied with a series of lessons (at different levels of complexity for the various grades) that they can teach for a week or two at the beginning of the cyclone season.

Among the material which should be covered is:

a. What is a cyclone? How and where they are formed, how and why they travel over water, what happens at landfall.
b. What is tidal surge? Why it happens, its relationship with tide, how water moves inland, how it leaves.
c. The role of community organizations in emergency preparedness.
d. How to make houses safer.
e. Emergency precautions.

In Appendix A are included some materials developed for use in disaster preparation lessons in Western Samoa.

J. Summary Comments on Awareness

The level of the coast, the height of the tidal surge and the path of a coming cyclone are things upon which we have little influence. The exposed community is the one component of cyclone vulnerability that governments and other intervenors can do something about in a short period of time. Some form of community organization is vital for a functioning emergency warning system. Similarly, the maintenance of multipurpose shelters (and the use to which they are ultimately put) depends on the sense of ownership felt by the local community towards their shelter. Community leaders and local authorities are also an important factor in reducing local vulnerabilities. So are local NGOs, teachers, healthworkers. They are the ones who will either enforce an evacuation order, or allow local elites to turn shelters into godowns, in effect depriving the community of the use of the shelter. What must be constantly recalled, however, is that the community itself, is the group upon which vulnerability reduction depends. All others are merely facilitators.

The elements of an effective community awareness will be different in every community because each communities' experience with the last catastrophic storm was different. For example, the INTERTECT team visited one community where villagers assured us that everyone had confidence in their shelter and would use it again. We visited a neighboring community and were told that people would be hesitant to use the shelter

again because several of the concrete columns had failed in the storm and local people had scant confidence in the repairs which were done in the interim.

Community awareness programs build on the experience, perceptions and even superstitions of the local people. It is always a mistake to insist that communities begin vulnerability reduction by abandoning deeply held patterns of thought and behavior: they will not change, and the confidence necessary for effective communication will be lost. Reaching the general population effectively requires different mechanisms for different component parts. The material in this section is not intended to be a cookbook. Rather it should be taken as a guideline. Just as each community has different strengths and weaknesses, each intervening agency has them too. Plans to increase awareness and organization in a community must build on existing strengths in all actors.

V. Shelter Management

A shelter which is going to be used by the people who need it when a storm comes is one which is integrated into the local community. Erection of the shelter should provide opportunities for meaningful local participation in planning and management, and local leaders should be encouraged to explore opportunities for self-help before seeking outside assistance and funding. Successful mobilization and/or evacuation depends on coordination at the local level, taking advantage of all available resources, and an awareness program which starts where the local people are and slowly increases their depth of understanding.

Every community should have an Emergency Coordinating Committee. Shelters should only be built after the Emergency Coordinating Committee (ECC) is in place and functioning. Creation of a working ECC might be used as a first condition (and consequently as an incentive) for finalizing plans for shelter construction. If and when there is a shelter, it can provide a focus for their efforts and a place for them to meet. However, the sooner community awareness work begins, the more effective it is likely to be, and an ECC can help begin general preparedness in coastal villages that still have not received multipurpose shelters.

The Red Crescent (RC) uses the ECC concept in some areas under the rubric of the Shelter Management Committee. The RC Shelter Management Committee is supervised by the Upazilla Development Officer. A typical committee is comprised of the union RC volunteer leader, the donor who gave the land for the shelter, a local teacher, and the local imam. Unfortunately, the RC structure does not cover the whole High Risk Zone. Expansion of the RC operation, especially considering the credibility and acceptance which RC volunteers enjoy, is preferable to the effort of building another organization. The networks, staff training, and recognition level enjoyed by the RC will take other organizations years to develop. However, if funding is not immediately forthcoming, then other organizations will be required in areas without RC presence.

The ECC and the creation of an emergency plan will be most important outside the RC-covered villages. In all the sections of this report, it has been assumed that in many communities, other NGOs may set up new programs around the proposed shelters. Many suggestions deal with those operations which will be outside of the established RC structure.

The following organizational issues for shelter managers highlight the important decisions which face emergency planners.

Roles in the Management of the Emergency Shelter

There should be an Emergency Coordinating Committee in each village. This group should contain representatives from all parties and groups which could potentially be called

upon to play a role in the event of an emergency. Within the High Risk and Risk Zones which will be targeted for a Community Awareness effort, the first task is to inventory the human resources which can be used to spread the educational message. Almost every community has vast social capacities, not all of which are commonly recognized. Among the leaders of every community we would expect to find: teachers, NGO volunteers and staff, imams, and other religious leaders ANSAR/VDP leaders, union officials, influential businessmen and large property owners. Less obvious but equally important are those structures which regulate important aspects of daily life. These include: water control committees, cooperatives, credit unions, and tube well maintenance groups.

The First Activities of the ECC.

It is of primary importance that ECC members agree to speak to the public with one voice, and to avoid giving out conflicting messages. They might agree to name one spokesperson. The ECC should begin its activities by developing a community emergency plan. ECC members should discuss the nature of their potential involvement in the event of a cyclone, and to commit themselves to a widely agreed-upon response. Among the items which should be covered at the initial meeting of a local level group are: possible mutual assistance networks with neighboring communities, the role of local government officials within the ECC, divisions of work and responsibilities, plans for periodic meetings, future meeting agendas, schemes to maintain the shelter, providing for needs in the shelter during emergencies.

Community Involvement in Preparing a Community Emergency Plan

It is important to go beyond the members of the ECC in drawing up a community emergency plan. Since an emergency plan seeks to identify the capacities and resources which can be brought to bear in case of a catastrophic event, individuals and groups from many walks of life need to be actively included in the planning process. All government officials who will be overseeing any emergency response should participate in the planning process so that they can be aware of the potential dimensions of the response and to begin developing those human relationships upon which any successful response will depend. In any given community, if any of the following are present, they should be involved:

* elected and/or administrative officials
* emergency management or civil defense agencies
* Fire Departments
* police and/or militia
* public works and/or transportation departments
* representatives from the Ministry of Agriculture

* public health workers
* water board officials
* schools
* health clinics and hospitals
* emergency medical services
* media (newspapers, local radio and TV stations)
* NGO volunteers
* businessmen
* labor union representatives
* community leaders
* representatives from all citizen groups

In the case of paid officials, it is preferable that participation in this committee be written into the official's job description.

In planning for any emergency, special care must be taken to identifying gaps in essential services and equipment. Those involved in a sector under normal conditions will be the best informed about those potential gaps which could bring everything grinding to a halt in the event of a crisis. And there must be special planning for the old, weak, and disabled in the community.

Needs of Each ECC group

In the 1991 cyclone, a significant number of shelters were not fully used [BRAC, 1991 and UNICEF 1991]. The reasons for this disuse are varied. Some have all ready been discussed in the sections above on Warning and Community Awareness. It is clear that successful warnings and shelter use hinge on successful awareness. Each local group should receive training, including information on how to train others. They should receive educational materials, fact sheets, samples of other community's emergency plan of action, descriptions of each hazard component, and a list of safety precautions. They should receive (or make) a map of the local community showing house locations, and help develop a plan for disseminating warnings. They should be helped to elaborate a list/description of those items which the community can provide for itself. They will require assistance in accessing available outside assistance which could be provided by CPP representatives or field inspectors from the Shelter Master Plan Coordinating Office. A simplified pre-disaster planning process for the ECC is as follows:

Step 1 - Identify the key sectors and areas likely to be affected in each community.

Step 2 - Determine what types of assistance people will need and estimate the types and levels of assistance they could reasonably expect to receive from within the community and from outside resources. From this list, identify the gaps that will exist.

Step 3 - Determine what services the organization can provide itself, giving priority to the gaps identified in Step 2.

Step 4 - Determine how each one of the gaps can be met and develop a plan for providing these services when needed.

Step 5 - Review the plan and determine if the organization needs any additional services or assistance to implement the plan, and if so, make arrangements to obtain these services when appropriate.

(Cuny, 1983)

Shelter Emergency Plan Implementation

Recent studies have shown that actions taken immediately after a disaster significantly determine the accident's impact. For example, the lack of emergency food and water has been identified as one cause of death following the April cyclone. As a result, on-site and local emergency actions are of critical importance. For this reason there is a widespread consensus that one of the first and most important decisions in preparedness planning is to determine the roles and responsibilities of all actors under a given set of circumstances.

Although it is imperative that all potentially involved parties be allowed to shape the plan as it effects their activities, the ECC is the local group which will coordinate both ongoing and emergency work at the shelter. Roles and responsibilities of all concerned parties at the local level must be clearly specified. Any emergency plan must name the responsible authority for a range of contemplated events, and establish a chain of command and coordination. Once roles and responsibilities have been determined it is critical to describe how and when the various individuals will communicate.

Among the tasks which should be covered within the ECC are:

A. Chairman: the leader of the committee and the person directly responsible for shelter operation during a crisis period.
B. Evacuation Team: in charge of mobilizing the area residents in case of an emergency.
C. Rescue Team: helps trapped families and injured individuals arrive at the shelter.
D. Warning Team: gets the warning out in a timely fashion.
E. Relief Team: control and distribution of relief supplies.
F. Shelter Team: maintains order and hygienic conditions in the shelter. Handles communication by radio. Provides water source in the shelter.
G. Damage Control Team: works with property owners to reduce wind and water damage.

The emergency plan developed by the ECC should address both the management of the operation of the shelter on a community-wide basis, and the non-operational aspects (such

as maintenance) as well. There are seven tasks that face shelter managers as a storm approaches:

A. Gather information on the type and magnitude of the emergency.

B. Determine/estimate the probable destruction in the area.

C. Determine appropriate strategic goals of the evacuation/mobilization.

D. Assess options and estimate resource needs, both for getting the warning out and for emergency food and water within the shelter.

E. Develop and initiate a plan of immediate action.

F. Evaluate the ongoing result of emergency actions.

G. Review the entire situation every time new information becomes available.

Local emergency plans implemented by those at risk in the emergency have an inconsistent record of success. In the crush of any emergency, committee responsibilities can be subsumed by concern for the individual and his or her family. In addition, committees can not expect that volunteer participants will be able to take a large share of the responsibilities. Particularly in the marginal economic conditions of coastal Bangladesh, large commitments of time from volunteers is not feasible. This does not mean that the ECC or the Emergency Plan is futile. Some, if not all of the plan will be implemented and will contribute significantly to saving lives. However, these comments about what can be expected should be kept in mind by all those who are involved in developing plans for shelter management and adjustments and contingencies made as necessary.

The ECC could also be mobilized in the event of any threat to the community including fire (when there is no designated organization).

Emergency Food and Water

Most coastal dwellers seem to buy staples on a daily basis. In villages where the consultants inquired, people seldom confessed to having rice enough for more than two days. There are many emergency preparedness measures which should be explored in this area: burying small reserve supplies (possibly in specially provided plastic bags), or the organized storage of food in spaces designed for this in the shelter. If shelters are designed with water catchment facilities, the abundant storm water can provide fresh water for the shelter users. This type design should be encouraged, particularly since (1) the quantities of water which will be needed would require significant effort to carry to the shelter, and (2) the collection of water in this way does not require the attention of a shelter manger at a time when he or she is likely to be diverted and need time to attend to other tasks.

Night Evacuations

Inevitably, a night evacuation to a shelter will be necessary. The consultants were given two reports of villagers in the risk zone preferring to stay in their houses, or even on the protective embankment, watching the storm and the water with freedom to react, rather than crowded in a shelter without that freedom. With nightfall the ability to monitor the storm and water disappears, and the shelter becomes more attractive. And as discussed, we can expect people to remain at their homes long beyond the time that they should evacuate in order to protect belongings. A mechanism for providing guidance to the shelter will save many lives in the instance of a night evacuation, particularly if the wind is high and it is raining. A small generator and a waterproof light fixture to act as a beacon would serve this purpose. If included as part of the original cost of the shelter, it would represent a small percentage. Inclusion of this equipment should be contingent on an effective ECC being in place to take responsibility for the safeguarding and maintenance of the equipment.

Use of the Multipurpose Shelter/Schools as the Headquarters of the ECC

In all disasters operational management takes place in the field, near or at the scene of the incident or highly vulnerable/damaged area. Emergency responders congregate at the shelters because they lead people in, and also because they check in periodically to get news of what others are doing.

Guidelines for Emergency Plan

As suggested, the Emergency Plan can begin with a model plan provided by the CPP. But it is extremely important that the emergency preparedness plan should reflect the thinking of all potentially involved parties. It should set out objectives which are widely shared. Mutual aid agreements between villages should be contemplated in the plan. It is common practice in all parts of the world for communities to agree to share equipment and personnel in the event of disasters. In developing countries where the resources available to cope with disaster are not likely to be plentiful, careful consideration should also be given to sharing personnel, equipment and other materials between communities.

Emergency plans typically describe the means to access needed information. The specialized information which shelter managers will require concerns first aid and emergency treatment for the surrounding community. Emergency plans need to take into account potential complicating factors. These could include communications breakdowns, broken lifelines, outbreaks of waterborne disease and other events which could credibly take place and make emergency operations more difficult.

One point must be emphasized. The roles of the actors must be clear in the final plan. This plan should be written as an exercise to assure clarification of the roles.

Shelter Checklist

A simplified desk-top checklist should be all that is needed for the multipurpose shelters. Communication systems are famous for not doing what was anticipated. Back-up coordination schemes are also warranted in case key individuals are absent from the community when a cyclone strikes.

Transient Populations

It is obviously impossible to create an organizational structure around people who do not stay put. While the best solution would be to allow migrant groups access to the regular shelters, the consultants heard reports about the forced exclusion from existing shelters of people who were not known in the community. Small separate shelters may be required for fisherman who seek refuge before a storm.

Possessions

Looting is a world-wide problem. Even countries which field armed forces to patrol the evacuated areas withdraw those forces when the storm puts their continued safety at risk. And fear of looting keeps vulnerable populations in high risk areas even in developed countries. In any cyclone, hurricane, or typhoon, failure to evacuate in time because of fear of abandoning possessions to looters will account for a significant percentage of deaths in the store, always among less affluent who are more protective of the small, but hard earned possessions and who inevitably do not have the means to secure them.

In the Philippines and in Caribbean countries, the fear of looting is somewhat reduced in communities where there is successful community organization. Broad participation in creating awareness and in emergency preparation in a community reduces fear of neighbors.

Inherent Difficulties with Preparation Programs

As mentioned above, the execution of emergency plans at the community level and the effectiveness of community-based emergency preparedness has an inconsistent record around the world. It is difficult to sensitize people to an event which occurs so infrequently in any culture, and when time, money, and other resources are subsumed in trying to create some economic security in an economically marginal existence, it often seems impossible. Nevertheless, in those places where awareness programs and emergency plans are sensitively created, people are more prepared and often lives are saved due to the residual effects of the preparation.

VII. GENERAL EMERGENCY PREPAREDNESS MEASURES

Village Level Programs

Many preparedness measures at the village level have been discussed in the sections above. Two other programs to reduce vulnerability merit mention:

1. Cattle and other animals. Providing a secure place for the wealth accumulated in animals is an essential part of any program with the goal of helping the populace return to normal economic activity as soon as possible. While in the field, the consultants discussed with villagers the alternatives for animals, both in the April 1991 storm and in future storms. As might be expected, animals that found high ground, or were left to fend for themselves stood the best chance of survival. Creation of high ground in the form of killas would seem to be the only alterative with a significant impact.

2. Trees. The role of trees in saving lives in the April 1991 storm is largely unappreciated. Coastal afforestation reduced the force of the surge in the areas behind them. Dr. Robert C. Sheets, Director of the United State National Hurricane Center hypthosizes that mangroves can reduce the destructiveness of waves in two ways: the trees themselves will disrupt the wave cycle, reducing the size of wave which continues beyond the mangrove barrier, and the mangroves will keep barrier type islands an dunes from eroding in the surge, maintaining a relatively shallow sea bottom which forces waves to break and dissipate their energy at the coast rather than inland. In addition, many of the reports of survival mention the fact that the survivor clung to a tree, or climbed a tree to get above the surge. While trees can not be expected to provide the main source of protection, their role as shelter-of-last-resort is very important, particularly in a situation where other adequate shelter is unavailable and not expected to be provided for some years. Trees, of course, can also provide significant sources of food and timber.

Government Level Programs

Disaster Preparedness Plan

In the three weeks spent in Bangladesh the consultants became aware of three organizations who are preparing disaster preparedness programs or plans: UNDP, Red Crescent/DPP, and the Bangladesh Disaster Preparedness Centre. The importance of such a plan is obvious and it would be useful for these organizations to compare notes and

coordinate activities. It is also important for those plans to outline programs which can be easily utilized by village Emergency Coordination Committees and NGOs working in the villages. The programs should provide a range of suggestions, activities and programs which can be used by NGOs and ECCs. The programs should include concrete plans for implementation with specific training packages for use in the villages. The Government of Bangladesh and other involved parties should make the implementation of village level disaster preparation programs a first priority. Without a good organization which will insure involvement at the village level, shelter use will not be maximized and management will be problematic.

Shelter Master Plan Coordinator

There is a great momentum building for shelter construction. The INTERTECT consultants identified six organizations who actually had shelters under construction, and others who intended to begin construction programs soon. Although there is perhaps no danger that more shelters will be constructed than are needed, there is clear need to provide some coordination for two reasons:

1. The information and data organization that the Cyclone Shelter Master Plan will provide will help these organizations plan and construct better shelters.
2. There is need for more logic to be applied to the site selection process. For instance, the island of Muhaskhali is targeted for several shelters to be built immediately. Yet this island is one of the few islands which has some potential for evacuation in that there is considerable high ground (large hills) on the island. While the shelters to be built on Muhaskhali are undoubtably needed, there are other more vulnerable situations which should receive more prompt attention. The Cyclone Shelter Master Plan could provide the rationale for more effective shelter site selection.

To provide the oversight to insure that all organizations are aware of the Cyclone Shelter Master Plan, to provide support and encouragement in site selection and village level organization, and to act as a clearinghouse for information on shelter construction and management, an office for Cyclone Shelter Master Plan Coordination should be created in the Ministry of Relief. The role of the office for Cyclone Shelter Master Plan Coordination would be, in addition to those outlined above, to provide organization and access to information resources needed in the construction and maintenance of the shelters. The office should be first a coordinating office, working with shelter building organizations to put their resources to the best use. The office should not carry permitting authority, or other powers which could legally impede the construction of shelters, but it should be in a position to comment on all shelter construction, file protests and draw public attention to

shelters which are not being constructed in accordance with the plan. In this role, its staff must have legal access to all construction sites. In addition to the tasks of encouraging shelter construction in accordance with the master Plan, the office should also encourage the formation of ECC committees or RC shelter committees prior to shelter construction. It should also promote complementary village level disaster preparedness programs, and other programs to insure good management of the shelters. Its employees should make regular visits to shelters to document the successful programs and report on innovative solutions from the field as well as identify areas of need and weakness. The office would help organizations focus the available resources on solving problems. This information would be disseminated to all shelter committees and NGOs in order to refine shelter management practices throughout the high risk area.

As an office which will provide resources for and work with organizations building shelters it will be extremely important that the physical location of the office not be in Dhaka, but near to the high risk area to facilitate access by interested NGOs and other organizations. Relevant documents, model preparedness programs, and other written material on the Master Plan and effective construction and management of the shelters should be available in the office without cost or for a nominal fee. A small staff should be able to perform the functions envisioned:

* The director would manage the overall program, especially the office and Master Plan information resources at the office. He would be the primary sources of information at the program office.
* Three field inspectors would perform shelter site inspections and provide liaison with the Master Plan office. They would advise shelter builders on site selection and help promote shelter management programs.
* Two office staff would support the Director and field inspectors and maintain the information resources.

Devolving Responsibility and Authority to Local Committees

The effectiveness of shelter program will be enhanced by coordination and effective management organizations at the village/shelter level. Attempts to organize villagers are likely to encounter resistance to purely volunteer positions. In interviews in the high risk areas as well as with organization officials in Dhaka, the consultants often were told that marginal populations expected the government or a western NGO to take care of them. When asked if they could provide some shelter management or preparedness activities on a volunteer basis, they expressed resentment that government officials and NGO staff received large salaries, and said that they (government or NGO) should provide the management.

Devolving of authority, responsibility, and resources to communities must begin as soon as possible. This will be a challenging task in the climate of relief and from the top down - which characterize government and NGO involvement in the area. It is likely that some financial resources will have to be transferred from the higher levels in some ministries to the local level. Local income schemes could provide some money for local management salaries or could augment a government contribution.

Private Sector Resources

Designated Shelter Program

Cyclone Shelter Master Plan Team members discussed with the consultants the concept of using low-interest loans for families or commercial enterprises who would upgrade a sound pucca building into a two story structure which could be used as a shelter. This is an excellent concept. In exchange for a low interest rate or deferred interest for a period of time, the terms of the loan should include an agreement that the building will be a designated "cyclone shelter", and made available during cyclone warnings. A plaque, or other public designation should be placed on the building to identify it as a possible shelter.

Adopt-a-Shelter Program

Bangladeshi businesses or civic organizations should be encouraged to support shelter construction and maintenance. In exchange, the organization's name would be associated with the shelter and displayed on the shelter. NGOs could use this type of project as the basis for fund-raising.

Other Programs

Maximum Protection of the Population in the Context of the Project Schedule

In order to provide maximum protection for the population of the high-risk zone, the overall plan should target some lower cost activities which can be implemented before, or parallel to the shelter cum school, shelter cum NGO office, or shelter cum community center construction program. These activities would be designed to provide some protection for at-risk populations until the shelter construction program is completed. Examples of such activities would be community based disaster preparedness programs as discussed above, and killas or mounds provided for livestock refuge which could also be used for human refuge in lieu of other forms of shelter. Killa construction should be started in those communities where shelter construction is not expected for two or three years. Leasing or sharecropping of killa land for cultivation (water can be provided by the pond created by the borrow pit) could be a revenue resource for the ECC.

Ideally, all communities begin ECC organization as soon as possible to provide the basis for management of shelters, killas, and disaster preparedness programs.

Evacuation

Evacuation is the cyclone or hurricane response activity used most effectively in most other countries subject to this type of storm. With its extremely low geographic profile and poor transportation infrastructure, this is often not an option in Bangladesh. Nevertheless, in some areas where the ground rises quickly, such as much of the eastern coastal area, it is an option. The possibility of evacuation can be approached on two fronts:

1. Evaluate this as an option in the areas on the east coast from Chittagong to Cox's Bazaar. Where feasible, the CPP should identify vehicles willing to participate in an evacuation and contract with them for transport in a specific area in the event of a large storm. Transport would be to a pre-arranged to a CPP managed shelter. To insure that adequate transport is provided, 15% to 20% more vehicles should be contracted than might be needed to account for those who will be unavailable on the specific day when they are needed.
2. Money spent on shelter construction in some areas may serve a larger population and aid economic development when used for road improvement and construction. If an all-weather road can be provided to a high-risk area, it will provide evacuation potential as well as economic development for the community.

The Raised Road Grid Scheme

The elevated road, constructed with fill dug from the area next to the road and usually three or four meters above the adjacent grade, is a well-known feature of the East Indian and Bangladesh lowlands. In Andhra Pradesh the British built a system of such roads on a grid pattern in the coastal areas. Roads extended inland from the coast approximately every one mile and were connected by raised roads running parallel to the coast at one mile intervals. This in effect provided a series of dikes or embankments which retards surge at one mile intervals. While this system may have little effect on massive surges close to the coast, it will protect inland areas in a small or medium surge. In the 1977 Andhra Pradesh cyclone, the grids provided some reduction to the effect of the surge.

The concept could be improved if the road widened was to create platforms fifty meters square at intervals of two miles from the coast. This area would serve as resting points for those fleeing the coast, and as high ground on which to leave animals while a family continued inland. Beginning sixty meters from the platform, the grade of the road should increase at the rate of .05m/1m (or a 5% increase) so that the platform is three meters

above the road elevation. If we assume an average road elevation of four meters above mean sea level (msl), the platforms would be seven meters above msl.

Elevated Villages Sites

The village of Char Magid south of Noakali is a planned community which has been built on a raised plinth about three meters above the surrounding land. The farmers and agricultural laborers who work the surrounding farm land live in this village, rather than in houses on their individual plots as is the pattern in most of the coastal area. This concept provide two advantages:

1. The elevation of the community provides protection against small surges.

2. In forming a community, the villagers more easily develop social relationships which can encourage community action for other preparedness measures.

Although the concentration of people will present hygiene and waste disposal problems which would not be an issue if the settlement pattern were at the density of other rural areas of Bangladesh, the concept merits study, particularly for those areas where land distribution is not yet settled.

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APPENDICES

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APPENDIX A

PREPAREDNESS MANUALS

BARANGAY DISASTER MANUAL

MINISTRY OF NATIONAL DEFENSE
OFFICE OF CIVIL DEFENSE
Camp General Emilio Aguinaldo, Q.C.
1978

REPUBLIKA NG PILIPINAS
REPUBLIC OF THE PHILIPPINES
KAGAWARAN NG TANGGULANG BANSA
(DEPARTMENT OF NATIONAL DEFENSE)
TANGGAPAN NG KALIHIM
(OFFICE OF THE SECRETARY)
CAMP GENERAL EMILIO AGUINALDO
QUEZON CITY

M E S S A G E

Disaster preparedness is an important adjunct of any program of national security and survival. The prevention of unwarranted loss of life and property when disaster strikes, as well as the conduct of well-coordinated and efficient post-calamity relief operations to restore normalcy and stability in the community, are responsibilities which must not only concern the agencies of government, but every institution and every citizen in the society.

In coming out with this publication, the Department of National Defense seeks not merely to provide an operational framework designed to enhance disaster preparedness at the Barangay level, but in doing so, to strengthen further the imperative of self-reliance in the grassroots level of the nation. In this regard, it is therefore our hope that this manual will not only enlighten our people on what to do in case of calamity or disaster, but remind them that ultimately, our success in resolving this crisis situations rests on the self-reliant application of our own labors, resources and capabilities toward the welfare of the community.

On this note, may I therefore congratulate the Office for Civil Defense for producing this manual in response to our President's call for the implementation of concrete measures to prepare our people for natural or man-made contingencies in line with the overall national security program of the government.

JUAN PONCE ENRILE
Secretary

F O R E W O R D

This pamphlet is designed to provide the Barangays with general instructions on the organization and implementation of disaster preparedness measures to protect and preserve their lives and properties during periods of calamities and natural disasters. In whatever part of the country we are located, the possibility of experiencing the disastrous effects of fires, floods, typhoons, earthquakes, tsunamis, and volcanic eruptions is always present. In the aftermath of that disastrous earthquake in Southern Mindanao last August 17, 1976, no less that the President himself has articulated the need for immediate and total preparation of our people in order to meet the disasters that come our way.

This pamphlet seeks to provide our people with appropriate guidelines in the organization and establishment of disaster councils which will form the nucleus of their pre-disaster and post-disaster activities. Also included in this pamphlet are safety measures to ensure maximum success in our damage-limitation program and contribute to the well-being and stability of our people and our country under the New Society.

VICTOR R RAGULAYAN JR.
Civil Defense Administrator

September 1976

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I. INTRODUCTION

The Barangay, like any other employer and property owner, has an inherent responsibility arising from the effects of enemy attack, fire, flood, explosion, serious weather disturbance, and disaster affecting community government as well as private facilities. To cope with these effects, the Office of Civil Defense-DND has outlined the basic factors to be considered in developing a disaster control organization and program that will be applicable to communities, government and private agencies, schools, and multi-occupancy buildings. It will serve as the framework for the community disaster control plan.

A disaster control plan should be put in writing. Plans and preparations to save lives and to protect property in cases of disaster and other catastrophies are simply good insurance.

DO IT NOW!

1. Prepare for survival of residents in the barangay.

2. Prepare for survival of your community.

3. Assist your municipality to develop a community survival plan.

II. NEED FOR PROTECTIVE ACTION

The Barangay disaster plan is aimed at protecting life and minimizing damage to property in cases of emergencies of all causes. One of the first steps is to identify clearly what is involved in protection against the effects of natural disasters, nuclear accidents or emergencies.

III. COMMUNITY SURVIVAL

The Barangay leader will want to take the necessary precautions to make certainthat the normal function of the community can be continued, after disaster interrupts it.

IV. DISASTER CONTROL

Right after the occurence of a major disaster, tension, chaos, and nervousness grip the populace. Destruction of buildings and other permanent structures will depend upon the intensity and extent of the calamity. The number of

casualties will depend upon the population density at any time of the day and degree of destruction in the community. Victims may be buried in the debris. Public utility services such as electricity, gas, sewers and water mains may be destroyed. Communications facilities such as the telephone and telegraph systems, radio and television may be knocked out.

The effects of these natural calamities and the fires that may follow them, as well as the casualties, produce a situation comparable in many ways to that which could be expected as a result of nuclear attack, except the presence of radioactive fallout.

It is in such situations where the need for organized group disaster work is essential. Individualized efforts are not enough to cope with tremendous task of emergency activities that have to be done immediately to aid the injured and to restore the much needed facilities.

Coordination of the emergency activities among government agencies including Barangays, private sector, and the military units are to be

directed toward the following activities:

1. Restoration of utility services.
2. Rescue and debris clearance work.
3. Demolition of dangerous structures.
4. Care of the injured and the sick.
5. Information on the missing.
6. Requirements for food, fuel, medical supplies, transportation, manpower and equipment.
7. Personal damage surveys.
8. Establishment of emergency operation centers for the proper coordination of the activities of the different units.
9. Identification and disposal of the dead.
10. Proper sanitation of the surroundings to avoid epidemics.
11. Housing problems for the homeless should be solved.
12. Higher local authorities should be informed.

PRE-DISASTER PREPARATION

To achieve coordination in the performance of such gigantic task as enumerated above, organization and training is a prime necessity long before the occurence of any disaster. For this reason, it is recommended that:

1. Families in the community should start organizing. This will facilitate training and be an asset to the individual, family and the community as a whole, when disaster strikes.

2. Logistical supplies, like food, medical supplies, equipment, manpower, transportation capabilities, etc. should be compiled.

3. Mutual aid understanding with neighboring barangays should be forged.

4. A Barangay Disaster Control Center should be set up. This facility should be clearly identified and its location should be known by all residents and the higher local officials.

V. PLANNING

Responsibility: The Barangay Leader shall be responsible for the development of Barangay Disaster Plan. He may, however, delegate this function to a Barangay Official who is qualified for this task.

In any event, all of the key people in the community should be involved in the development of the Disaster Plan. Such plans should be coordinated with the Plans of the Municipality.

The plans should be such that it can cope with all types of emergencies; that pre-planned actions can be effectively carried out. However, the plan should be flexible so it can be modified to cope with unforseen circumstances.

VI. BARANGAY DISASTER CONTROL COUNCIL

1. GENERAL: Based on the requirements established in the Disaster Plan, a Barangay Disaster Control Council should be developed that will provide for the protection of life and property in all types of emergencies.

2. ORGANIZATION PRINCIPLES: The Barangay Disaster Control Council should be [illegible] specifically to provide the needs of the community. The BDCC is formed and staffed in accordance

with the Plan, and the responsibilities and functions of the staff are defined in this handbook.

a. BASIC CONCEPT: The basic concept underlying the Organization is "Self-protection". This is accomplished by organizing and training small groups of residents for the performance of specialized tasks.

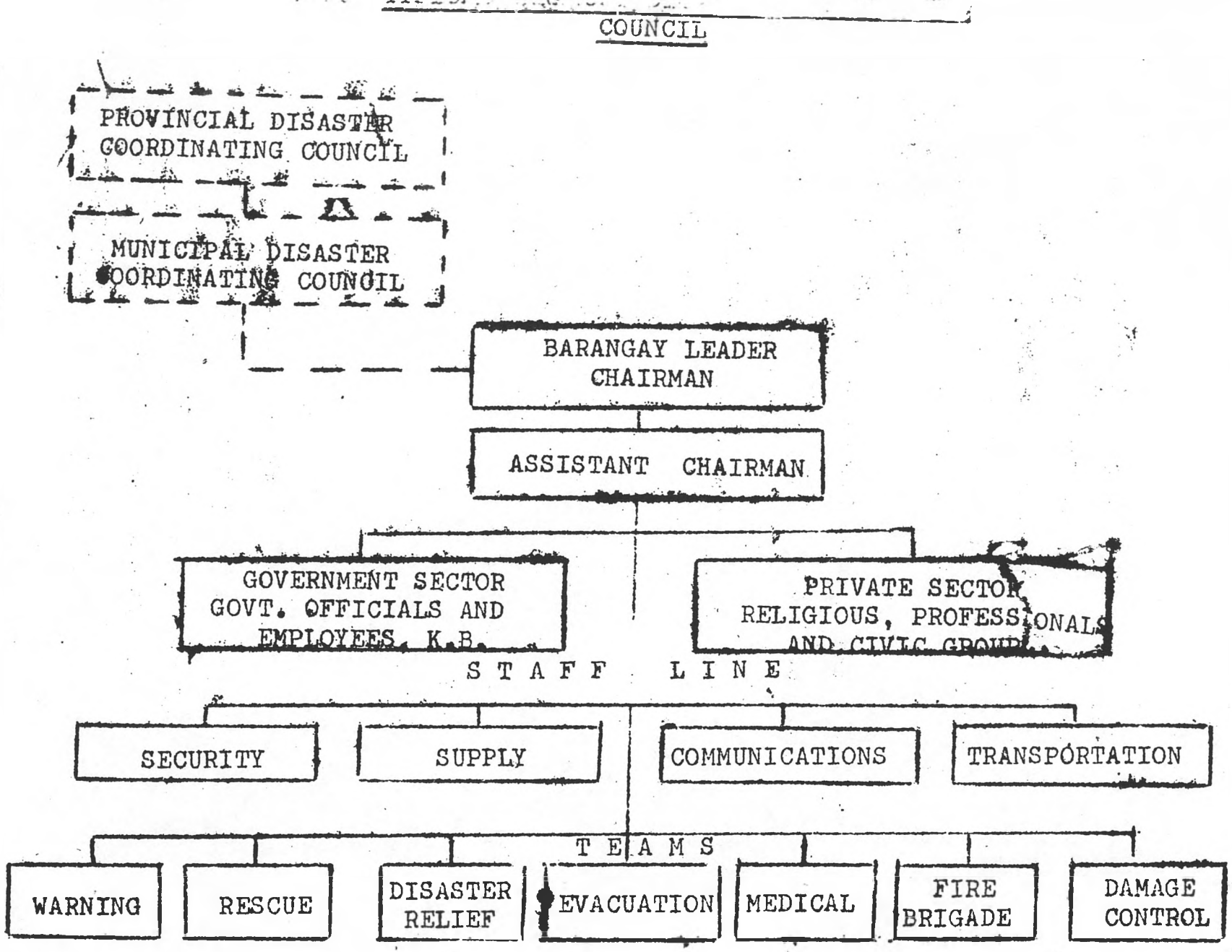
b. Using Existing Capabilities: The BDCC should be composed of residents chosen on a "best qualified" basis, taking into consideration prior training, experience or other special capabilities of the resident involved. A community-wide survey should be made to identify residents with self-protection skills and experiences.

c. Organization: The following shall constitute the minimum number of teams to be organized: Warning Team, Evacuation Team, Rescue Team, Disaster Relief Team, Medical Team, Fire Brigade and Damage Control Team. The number of persons in each team shall be from 5 to 10 or bigger as necessary.

The following staff or support teams shall also be organized to support the activities of all the lines or action teams:

a. Security Team
b. Supply Management Team
c. Communications Team
d. Trarsportation Team

The following chart shows the basic typical Barangay Disaster Control Council. The teams shown at the lowest level of the chart are directly working with the residents.


COUNCIL
PROVINCIAL DISASTER COORDINATING COUNCIL
MUNICIPAL DISASTER COORDINATING COUNCIL
BARANGAY LEADER CHAIRMAN
ASSISTANT CHAIRMAN
GOVERNMENT SECTOR GOVT. OFFICIALS AND EMPLOYEES, K.B.
PRIVATE SECTOR RELIGIOUS, PROFESSIONALS AND CIVIC GROUPS
S T A F F
L I N E
SECURITY
SUPPLY
COMMUNICATIONS
TRANSPORTATION
T E A M S
WARNING
RESCUE
DISASTER RELIEF
EVACUATION
MEDICAL
FIRE BRIGADE
DAMAGE CONTROL

VIII. DUTIES AND RESPONSIBILITIES

1. GENERAL: The duties and responsibilities of the Barrio Disaster Control Headquarters personnel should be defined in the Disaster Plan. This chapter outlines the duties and responsibilities of the principal officers and team leaders.

2. BARANGAY LEADERS: The Barangay Leader, as Chairman, is responsible for:

   a. Developing the Plan to protect life and property and to minimize damage in the event of a civil defense emergency operation required by the Plan.

   b. Coordinating such planning with the next higher local authority;

   c. Selecting, organizing and training an adequate staff to conduct the emergency operations required by the Plan.

   d. Establishing designated primary and alternate evacuation areas; and

   e. Directing and supervising the activities of the residents during an enforced stay in the shelters.

The Barangay Leader performs at least the following duties:

a. He insures that the basic provisions of the plan are disseminated to all persons in the Barangay.

b. He establishes a Disaster Control Headquarters from where the activities of the BDCC may be directed in an emergency.

c. He maintains liaison with other Barangays.

d. He maintains liaison with the municipal civil defense director.

e. He initiates and conducts training courses for disaster activities with assistance from appropriate agencies.

f. He coordinates arrangements for and directs all drills and exercises.

g. He exercises command responsibility for the implementation of the Disaster Plan.

h. He arranges for and supervises the storage and disposition of required supplies and equipment.

i. He works closely and cooperates with the local civil defense director in all matters involving planning.

organization, training and operations.

j. He assesses the nature and extent of damage resulting from any incident and reports this to the Municipal Mayor who is the local Civil Defense Director.

3. ASSISTANT CHAIRMAN: The BDCC should include an Assistant Chairman who serves as the principal assistant of the Barangay Leader and acts for him in his absence. He performs the same duties as the Barangay Leader whenever necessary. He may not, however, be the same person as the Vice-Chairman of the Barangay Community Council.

EVACUATION TEAM LEADER: The Evacuation Team Leader is responsible for supervising and expediting the planned and controlled movement of all residents in an emergency. Under the general direction of the Barangay Leader, the Evacuation Team Leader performs the following duties:

a) Plans movement routes and establishes movement procedures to give effect to the Evacuation Plan.

b) Breaks up the Barangay area into convenient blocks and assign Block Leaders.

c) Directs and supervises evacuation activities during drills and actual emergencies.

(1) DUTIES OF BLOCK LEADERS:

Under the general direction of the Evacuation Team Leader, these block leaders supervises and expedite the movement of residents from their dwellings to designated areas of refuge.

(a) Making certain that routes are clearly identified and are made known to the residents concerned.

(b) Maintaining a roster of physically hnadicapped persons regularly in the area and making appropriate special provisions for their movement in an emergency.

(c) Assuring that the procedures to be followed on the receipt of warning signals are known to all residents including specifically the proceedures to be followed on "Alert", "Take Cover, "Fire" and any other alarm signal provided for in the Plan.

(d) Assuring that all persons have vacated the assigned area when this is required by the Plan.

5. MEDICAL TEAM LEADER: The Medical Team Leader serves as head of Medical Team. He is for training and equipping all personnel assigned to perform medical or first aid services in an emergency, and for supervising emergency first aid or medical self-help operations within the Barangay during an emergency. His duties include, among others:

a) Arranging with the government health agencies, Red Cross or other sources for first aid and medical self-help training for all organization personnel who need it.

b) Supervising the selection of first aid or medical treatment areas in shelters and elsewhere, as required.

c) Directing first aid or medical self-help operations and controlling access to medical supplies, as required, to assure the proper use, conservation, and availability for emergency use.

d) Maintaining adequate sanitation and hygienic standards, and other matters relating to emergency health, hygiene

and medical activities within the Barangay during an emergency.

e) Inspecting the storage and handling of food and drinking water in shelter areas.

6. RESCUE TEAM LEADER: The Rescue Team Leader is responsible for locating injured or trapped persons and removing them to a place where they can be cared for safely in an emergency. Under the general direction of the Barangay Leader, he performs the following duties:

a) Organizes and trains the rescue team or teams provided for in the BDCC Plan.

b) In cooperation with the Medical Team Leader, insures that the members of the rescue team are proficient in on-the-spot first aid techniques; and

c) In cooperation with the Fire Brigade Leader, obtains appropriate equipment (e.g., handtools, ropes etc.) for temporary use during rescue operations.

7. FIRE BRIGADE LEADER: The Fire Brigade Leader serves as head of the Fire Brigade. He organizes firefighting teams (or brigades) for initial firefighting operations. His duties include:

a) Providing fire-fighting instructions through available sources, such as training schools, local fire departments, etc.

b) Assuring that fire-fighters know their stations, locations of fire-fighting equipment in their area of responsibility and the alarm signals which direct them to their stations.

c) Deploying fire-fighting personnel to fire areas to extinguish or contain fire pending the arrival of other firefighting forces and co-operating with such forces upon their arrival; and working closely with the dwellers or residents on matters of fire prevention and protection.

8. DAMAGE CONTROL TEAM LEADER: The Damage Control Team Leader is responsible for controlling utilities in the community during an emergency. The functions of the Damage Control Team Leader include:

a) Establishing a plan to attend to water, gas valves, power switches, etc.

b) Deploying personnel, after any disaster to reconnoiter and correct damage to utilities or to report

conditions which require assistance.

c) Clear roadways and streets of fallen trees and other debris.

d) After performing the primary task in paragraphs a, b and c above, the Damage Control Team may be assigned by the Barangay Leader to maintain the physical facilities of evacuation centers, and assess damages inflicted on the area.

9. WARNING TEAM LEADER: The Warning Team Leader should insure that warning signals can be received by all residents in the Barangays.

a) All residents should be educated on the meaning of different warning signals and the different actions to be taken if such signals should be given.

b) Organizes Warning Team members who shall be assigned to certain blocks in the Barangay.

c) Keeps and maintains appropriate warning devices such as sirens, bells, gongs, flags and lights etc. and operate these devices when needed.

d) Maintains constant contact with the Barangay Leader so that warning issued by the National Agencies may be promptly disseminated.

e) Undertake warning drills as necessary.

10. DISASTER RELIEF TEAM: The Disaster Relief Team shall be responsible for:

a) Receipt and registration of evacuees from Evacuation Team Leader.

b) Emergency housing of displaced persons or evacuees in Evacuation Centers or those absorbed in private homes.

c) Emergency feeding of displaced persons or evacuees in Evacuation Centers or those absorved in private homes.

d) Receipt and storage of supplies and equipment needed for the shelter operations.

e. Informing higher authorities of status of Disaster Relief activities and coordinating with other Relief Agencies.

IX. DUTIES AND RESPONSIBILITIES OF STAFF TEAMS:

1. SECURITY TEAM LEADER: Security Team Leader shall be responsible for:

a) Securing vacated houses or areas, evacuation centers and areas of operations.

b) Coordinate with the Integrated National Police for the security of the areas.

2. SUPPLY TEAM LEADER: The Supply Team Leader shall be responsible for determining the supply requirements of all the action teams.

He shall:

a) Identify the sources of such supplies as may be needed.

b) Receive such supplies and to channel the same to the team leaders as needed.

3. TRANSPORTATION TEAM LEADER: The Transportation Team Leader shall be responsible for the transport needs of the BDCC. His duties include:

a) Determining the transportation needs of all the Barangay Action Teams.

b) Identify all locally available transportation facilities in the Barangay and tapping these sources as needed.

c) Coordinate with counter-part transportation team leaders of other Barangays for possible use of their transportation facilities.

4. COMMUNICATIONS TEAM LEADER: The Communications Team Leader shall be responsible for:

a) Receipt of warning information from the local civil defense directors or other sources and disseminating the same to the Barangay Warning Team Leader.

b) Maintenance of appropriate communications links with the next higher local authority.

c) Organization and equipage of couriers.

d) Keeping of records of all warning and communication messages.

e) Liaison with the local media.

X. COUNTER MEASURES

I. HOW TO PREVENT PANIC

The dictionary defines panic as a "sudden, unreasoning, hysterical fear, often spreading quickly". Panic is caused by fear although those involved may not know what they fear.

In certain circumstances, it is conceivable that, despite pre-emergency preparations, an unorganized group may be on the verge of panic. Barangay team leaders should be prepared to deal

with this in terms of the following principles:

1) Provide assurance - Exert positive leadership. Reasure the group by giving instructions and information calmly.

2) Eliminate unrest - Dispel rumors. Identify trouble-makers and prevent them from spreading discontent and fear.

3) Demonstrate decisiveness - Suggest positive actions. Indicate what to do, rather than what not to do.

II. EARTHQUAKES

The initial shock of an earthquake may last from a few seconds to almost a minute to be followed by after-shocks which are generally lesser in intensity than the first. After-shocks may come in rapid succession immediately after the initial shock or the interval of after-shocks may vary from a few minutes to several hours or days and may keep repeating for weeks or months. The degree of damage to life and property will depend upon the intensity of the initial shock and after-shocks. The occurence of an earthquake cannot, as of now, be predicted but efforts are being exerted to develop instruments that

can warn scientists of an impending earthquake.

Working on the above premises, the following precautionary measures and instructions are hereby prescribed.

WHEREVER YOU ARE, DO NOT PANIC, BE CALM

IF YOU ARE INSIDE A BUILDING:

a. Seek cover under heavy furniture like tables, bed, or couches. This will serve as shock absorber from falling walls and debris or heavy objects.

b. Do not try to get out of the premises for you will not have the time to do so.

After the Initial Shock or Tremors:

a. Slowly get out of the place where you sought cover, if you can, then;

b. Shut off all main switches, like gas and electricity;

c. Calmly get out of the building and go to open spaces where you can keep a distance of about ½ the height of the tallest building in the area.

d. In getting out of the building, do not use the elevator.

e. Wait for further announcements from proper authorities.

f. Do not believe in wild rumors and unfounded predictions.

IF YOU ARE IN AN ALLEY OR STREET BETWEEN TALL STRUCTURES AND WALLS:

a. Your first action should be to seek cover. Inside parked cars, motor vehicles or strong structures are the best places.

b. Beware of falling electric post and wires, falling debris from buildings and signboards, street signs, etc.

c. Stay away from loosely hanging objects that may fall.

WHEN YOU ARE INSIDE A MOVING VEHICLE:

a. In a Mountainous Area:

Maintain presence of mind. Stop vehicle in a safe place away from precipices where landslides may occur but stay put inside vehicles.

b. In the City or Town:

Stop the vehicle in a safe place far from tall buildings and stay inside until tremors subside.

After the Initial Shock or Tremors:

Slowly drive your vehicle and avoid passing near landslides, ground fissures, near damaged dams which are causing overflows of water and

flood, and avoid falling debris and crumoling walls or structures when driving in cities or towns.

AFTER THE EARTHQUAKE:

The following are measures suggested for the community to observe and execute:

a. Activate the Disaster Teams at once.

b. Implement pre-planned action, if necessary.

c. Report losses, if any, to higher authority.

ON-THE-SPOT INTERVENTION BY BARANGAY DISASTER CONTROL CENTER:

1. The first thing that should be done in case people are buried alive in the debris is to insert pipes of any diameter at different levels, at any direction in different places in the debris in order to serve as air inlets for piped air to minimize the occurence of suffocation among the trapped victims. After this initial procedure, rescue work should be started immediately to extricate the victims.

2. Establish first aid stations immediately within the vicinity of the disaster area to take care of the injured. A casualty post should also be established in the nearest school building or any occupied permanent structure to

take care of those who have developed shock, preparatory to their evacuation to permanent hospitals.

3. Never transfer rescued victims directly to hospitals. Shock should be controlled first to prevent the useless loss of lives. LET the doctors decide when to transfer the patient.

4. Emergency power supply should be installed in the area of disaster in order to have continuous round-the-clock rescue operations.

5. Damaged main public utility lines like water, gas, electricity and communications facilities, should, if possible, be restored immediately.

6. Survey damaged buildings and advise people to evacuate said premises, if found to be structurally unsafe. These areas should be cordoned off to keep the public at a safe distance. Security should be strictly enforced to avoid further damage to property and life.

7. Control and put out fires, [illegible]

8. Accurate dissemination of information to the public should emanate from the local operations center.

9. Communications should be maintained between operations center and field units (relief demolition, rescue, medical) by use of radio transceivers, telep[illegible]e, couriers and other means of communications.

10. Traffic flow must be controlled.

11. All appeals for help should emanate from the Control Center and all donations should be received by the same for proper distribution depending on the needs in the field.

12. Proper maintenance of santiray condintions should be instituted to prevent spread of diseases.

13. Identification and disposal of the dead should be started as soon as possible, if there are dead victims.

Whenever it becomes necessary to bury the dead before positive indentifciation is established, photographs and fingerprints of the cadaver shall be taken whenever possible.

III. TIDAL WAVE OR TSUNAMI

1. Not all earthquakes cause tsunamis, but many do; when you hear that an earthquake has occured in the Pacific Ocean area, stand by for possible communications from your local emergency headquarters.

2. An earthquake in your immediate area should be interpreted as a natural tsunami (tidal wave) warning; do not stay in low-lying coastal areas after a local earthquake has occured.

3. A tsunami is not a single wave, but a series of waves. If you have been evacuated,

stay out of the low-lying coastal area until the entire wave-series has passed.

4. Approaching tsunamis are sometimes heralded by a noticeable rising or falling of coastal ocean water. This is nature's warning; it should be heeded by those in low-lying coastal areas.

5. There is at present no way to determine in advance the size of tsunamis in specific locations. A small tsunami at one beach can be a giant a few miles away; don't let the modest size of one make you lose respect for all.

6. The government does not issue false alarms: When a warning is issued, a tsunami exists. The tsunami of May 1960 killed 61 persons in Hilo, Hawaii, who thought it was "just another false alarm".

7. All tsunamis - like typhoons - are potentially dangerous even though they may not strike each Philippine coastline or do damage at each coastline they strike.

8. Never go down to the beach to watch for a tsunami; when you can see the wave you are too close to escape it.

9. Sooner or later, tsunamis visit every coastline in the Philippines. This means that tsunami warnings apply to you if you live in any coastal area.

10. During a tsunami emergency, your local disaster organization will try to save your life. Give them your fullest cooperation.

Make a point of learning these important facts, AND WRITE THEM DOWN:

Source of official evacuation advice: _____

Height of your street above sea level: _____

Distance of your street from coast: _____

Location of safe area: _____

For tsunamis of distant origin, potential danger areas are those less than 16 meters above sea level and within two kilometers of the coast.

For tsunamis of local origin, potential danger areas are those less than 30 meters above sea level and within two kilometers of the coast.

IV. TYPHOONS

1. Keep your radio and/or TV on and listen for the latest weather bulletins and announcements. Be sure to have spare, fresh batteries for transisterized radio.

2. Pay no attention to rumors.

3. Get away and stay away from low-lying beaches or other locations which may be swept by high tides or storm waves. If your only passage to high ground is over a road likely to be under water during a severe storm, then leave early.

4. If your house is up out of the danger of high tide and is well-built or anchored, then it is probably the best place to weather out the storm.

5. Board up windows. Use good lumber securely fastened. Makeshift boarding may do more damage than good. Whenever applicable, anchor house with strong guy wires.

6. Get extra food, especially things which can be eaten without cooking or with very little preparation. Remember that electric power may be cut off.

7. If emergency cooking facilities are necessary, be sure they are in working order.

8. Store water as water service may be cut off.

9. Have flashlight in working condition and keep it handy.

10. Check on everything that may blow away or turn loose. Flying objects become dangerous during typhoons.

11. If the eye of the typhoon passes over your place, there may be a lull lasting from a few minutes to half an hour. Stay in a safe place. Make emergency repairs during the lull if necessary, but remember the wind will return suddenly from the opposite direction, frequently with even greater violence.

12. BE CALM. Your ability to meet emergencies will inspire others and help them.

V. FLOODS

1. Occupants of dwellings situated close to banks of rivers should be prepared to evacuate to high ground, when typhoon warnings are issued. Do not sleep or spend the night in such dwellings when there are indications of fast rising water levels in the river coupled with continuing strong rains.

2. Family evacuation plans should be made in advance. Each member of the family should be given specific instructions and responsibilities in case of evacuation.

3. Occupants of dwellings affected by swift currents should evacuate to high areas when the depth of flood is still below knee depth.

4. When a typhoon warning is announced, tie down or secure weak dwellings or houses against being carried away by swift currents.

5. Do not go swimming or boating on rivers when there is a flood.

6. Drink only boiled water during and immediately after a flood.

7. Eat only well-cooked food during the flood emergency. Protect left-overs against contamination.

8. Avoid unnecessary exposure to the elements.

9. Submit to immunization against cholera, dysentery and typhoid as required by health authorities.

A CHECKLIST OF PROCEDURES IN PREPARING FOR DISASTER AT THE BARANGAY

1. Organize the local Disaster Control Council (BDCC).

2. Appointment of Team Leaders.

3. Develop the Disaster Plan.

4. Establish a control center and communication system.

5. Assess vulnerability of control center and communications system.

6. Arrange for receipt and dissemination of warning.

7. Develop emergency switch-off procedures.

8. Plan for mass movement of people to safer places.

9. Organize residents into special groups for self-help.

10. Forge mutual assistance agreements with neighboring barangays.

11. Establish a security system in coordination with the Integrated National Police.

12. Establish leadership succession list to ensure continuity of the management of the BDCC.

13. Establish alternate locations of BDCC.

14. Protect Barangay records and documents.

15. Prepare to quickly assess and report damage following any disaster.

16. Plan for emergency repairs and restoration.

17. Develop plans for quickly training residents as member of disaster action teams.

18. Prepare a manual of the Barangay disaster plans.

19. Inform all concerned about the plan.

20. Test the Barangay disaster plan with drills and exercises.

21. Inform and educate residents in methods of personal and home survival.

22. Maintain an up-dated roster of Barangay residents.

FIRE SAFETY TIPS FOR THE FAMILY

In the event of multiple fires such as may follow an earthquake or enemy attack, your local fire department may not be able to handle the situation. Fighting fires in your home or neighborhood will be up to you.

Knowing how to fight the fire can save your life, the lives of your family members, and your neighbor, in the community. It can save your home and your neighbor's home or even part of your community. It can stop small fires from growing into a big one.

PROCEDURE:

Training, tools, and plenty of practice are the bases for good fire fighting. Drills should be held regularly and more often by your family. Each member of the family should be given certain duties and the family should see to it that they learn to work as an efficient team. Change assignments from time to time so that everyone in your home acquires a certain knowledge of the fire-fighting job.

1. As soon as possible, after the occurerc of a major disaster, check your house to see if fire has started. Appoint an inspector and helpe for this task, starting at your shelter, time how long it takes them to reach the upper story and work down. Make sure that all passage-ways

including stairways are cleared of obstacles and kept clear.

2. Find out how long it would take to get water to the upper floor of your house if it were afire. Appoint a firefighting team and time them in their job of getting the hose, or buckets into place. Your garden hose, with adpaters which allow you to couple the hose to your kitchen or bathroom faucets should reach all parts of your house.

3. If water supply fails, your hose will be useless. Check the time it takes to carry buckets of water or sand to the upper floor of your house or to any other part of the house. If it takes too long-more than two minutes-distribute more buckets for emergency use and keep it filled with water or sand for ready use.

4. Searching for a missing person in a wrecked or burning building should not be done by one person alone. Teamwork is always better and safer. To conduct a practice search, appoint two-members of your family as demonstration team and hide a supposed victim in an out-of-the-way part of the house. People who become confused and frightened in an emergency, especially children, hide under beds, closets or bathrooms. Have your search team look in every room and in every possible hiding place.

5. If a door is hot to touch, the searcher may expect to find fire or heated gases when he opens it. Smoke explosions often occur when air comes in contact with such gases. Whether the

door opens toward or away from the searcher, he must have some protection against the explosion or heat when the door is opened. A wet blanket or big piece of cloth over the head is suggested. He should turn the doorknob, push (or pull) and duck to one side behind the wall. This will protect the searcher from flames or explosive gases.

6. Everyone in your family should know how to get away from fire if it gets out of control, without getting trapped. To escape from a smoke-filled room, tie a handkerchief, moist if possible, or other cloth across the mouth and nose. Then drop to the floor and crawl on your hands and knees, as close to the wall as possible. Follow the wall around to the door if you cannot see where you are going. A blindfold will make this practice more realistic.

7. If you can't get down the second floor stairs, you may have to hand by your hand from a window sill, then drop. An adult can cut his fall by about 7 feet if he lowers from window as far as he can before letting go. Have one of the younger members of the family demonstrate this drop from a low or ground-floor window, to show how it works.

8. If you are caught on a second or third floor, you can tie sheets together with square knots and secure one end of your improvised rope to a heavy piece of furniture. Then drop the other end out of the window and climb or slide down. You may not be able to reach the ground this way, but you will be that much closer to it when you drop, with less chance of hurting yourself. Demonstrate only the knot-tying part of this exercise. This method of escape is dangerous but your family should know about it in case of emergency.

LIFE SAVING TIPS

Do not move an injured victim at all unless he is in danger of further serious injury if left where he is.

Points to find out a victim's condition:
Look at his face -

1. If he is flushed or red in the face, he may have a skull fracture or serious head injury.

2. If he is pale, he may be suffering from shock caused by bleeding, burns, broken bones, crushing injuries or fright.

3. If his lips and finger nails are blue, he may be suffocating or in shock.

If you have not taken a first-aid course call a trained first-aider to help you before further treatment by a physician.

PROCEDURE:

1. To learn more about saving lives, have members of your family take a first-aid course of the kind given by the Philippine National Red Cross. Do not wait for an enemy attack before getting interested in first-aid. Bad accidents na local disasters happen everyday and may involve your family.

2. You should have a first-aid kit and know how to use it.

3. For serious bleeding, first get the victim to lie down and remain quiet. Try to stop bleeding by pressing a cloth pad over the wound itself. Towels, sheets or anything else at hand can be used for emergency pads and if possible, they should be cleaned. Bind the cloth in place. The important thing is to stop the bleeding, and direct pressure on the wound very often would do it.

4. Do not use oil, grease, or anything else on a bad burn. Simply cover the burned area with clean dry cloth. In an emergency you can use strips from torn sheets, towels, pillowcases or anything similar.

5. If it is absolutely necessary to remove a victim with a broken bone, first put a splint on the fracture. A piece of wood as a splint, well secured to the broken limb so that the ends of the bone can not move will serve as a splint. In an emergency, anything from a thick bundle of old newspapers to a broom handle can also serve as a splint. The splints should be long enough to reach beyond and below the joints of the break. Wrap each splint heavily with cloth to pad it and make the patient more comfortable.

To apply a splint, lay it alongside the broken arm or leg, then tie it snugly in enough places so that the broken bone can not move. Do not tie too tightly, or you may cut off the blood supply or injre the nerves. Put padding under

the ties all the way around the limb.

6. Severe shock brings unconciousness. If the shock is very deep, it can produce death. Severe shock should be treated by a physician but you can take emergency action while awaiting professional care.

The first steps are to keep the victim lying down, and to wrap him warmly. Use whatever you have at hand to keep him warm, but don't let him be overheated. If the patient perspires too much, his condition will get worse.

The victim's head should be level with or lower than his body. However, if there is a head injury, raise the head slightly.

First aid for mild shock victims should include the use of a saline solution made from one teaspoonful bicarbonate of soda, and a quart of water. The saline solution should be given to such shock victims only upon the advice of a physician, nurse or trained leader of a first-aid team. In cases of severe shock, saline solution given by mouth may cause casualties to vomit and choke. Casualties with abdominal injuries should never be given solutions to drink.

Casualties who are in mild shock may be given as much saline solution to drink as they want.

7. Suffocation can result from pressure on the neck or chest, as when the victim is pinned down by wreckage. It also can be caused by inhaling dust, dirt, smoke, or gas. Contact with a live electric wire may paralyze the nervous system which controls breathing. Drowning persons are victims of

suffocation.

The first emergency action when a person is suffocating is to get him away from the cause. Then start some form of artificial respiration as soon as possible. The mouth-to-mouth (or mouth-to-nose) technique of artificial respiration is a good method to use.

WHAT TO DO IF SOMEONE IS TRAPPED

Rescue work requires properly trained workers. Hastily moving wreckage or debris to free a trapped victim may cause him additional injury or may cost his life and may also injure the rescuer. This may also aggravate his injuries. Therefore, don't move an injured or unconscious person unless he has been given first aid.

PROCEDURE:

The danger of fire, electric shock or suffocation may make it necessary for any member of the family to act before the arrival of trained rescuers. The following exercises describe some of the things one can do to save a life without endangering himself or the victim.

1. In looking for a missing member of the family, start from the bottom of the house and work upward. If the victim is found unconcious, put him on the floor unless his injuries forbid it. If he must be moved, carefully turn him on his back and tie his wrists together with a handkerchief or other article of clothing. The rescuer, by kneeling astride the victim and putting his head under the tied wrists, can then crawl forward, dragging the victim beneath him. This is known as the "fireman's drag".

2. To move an unconcious victim downstairs, place him on his back with is head toward the stairs. The rescuer should put both his hands under the victim's armpits and cradle his head in the crook of one elbow. Then, he should back down the stairs slowly, letting the victim's feet trail. This is known as the "incline drag".

3. In an emergency, a chair may be used as a stretcher. Raise the victim to a sitting position and lift him gently into a chair, supporting his knees and back. One rescuer can then carry the chair by its front legs, the other by its back rest. This is known as the "chair litter carry".

4. Two rescuers can make a four-handed seat on which to carry a conscious victim. Each rescuer steadies the victim with an arm around his back.

5. To make an improvised stretcher, take a door or shutter off its hinges, or use an ironing board, or a wide board such as the leaf of a dining table. Lay the stretcher on the

ground, lift or slide the victim into it as gently as possible, and tie him in place with strips of cloth if the stretcher is narrow.

6. If the victim is in contact with a live wire, the rescuer must not touch him without first protecting himself. The rescuer should shut off the current, if he can. Failing this, he should stand on dry wood or paper and cover his hands with heavy dry gloves or cloth before touching the victim. Better still, he should poke or pull the wire away from the victim with a dry stick such as a broom handle or rake handle.

7. Leaking gas, fuel oil, or water are all dangerous to unconcious persons, especially in basements. If your local utility companies have not already issued instructions for controlling these utilities if damaged, check with the utility companies to learn the local policy.

8. Some kind of a lever is useful for lifting wreckage or heavy debris off a victim. Your home contains many things that could be used as lever-bed slats, spare lengths of pipe, a pick or shovel, or even an ironing board. When using a lever to raise wreckage from a victim, you should prop up the object to keep it from falling back on him.

Upset a heavy chair or couch and demonstrate how easily it can be raised with a lever (use a length of 2" x 4"). Be sure to use a pivot (fullcrum) that will not slip or crumble.

Loads should be propped up as they are lifted. This takes the weight off the lever to get in position to raise the load higher. Use books, shoes, doorsteps, or bricks for props to hold the load in position at various stages.

PRACTICE:

1. Get the family together and discuss the possible ways in which they could be trapped if disaster struck your home.

2. Make sure everyone understands how to search the house for victims, even if fire has started.

3. Make doubly sure everyone in the family knows how to remove injured victims and has practiced ways of doing this.

4. Finally, make certain all members of your family know how to escape from the house if the usual exits are blocked.

EMERGENCY PROVISIONS OF SAFE FOOD AND WATER

Most of us depend on the public health services to guard our family health, but many of these services can be knocked out temporarily by disaster. Therefore, the family should have the following proficiency and knowledge to guard the family health.

PROCEDURE:

They should prepare to solve their own food, water, and sanitation problems for at least two weeks following the disaster.

1. To insure the supply of fluids to each and every member of the family, an estimated seven (7) gallons of fluids for each and every member of the family should be provided. This may seem a lot of fluids to store but if we know that milk, soft drinks, fruits and vegetable juices are sources of fluids then storing fluids will not be a great problem. We must also remember that hot water tanks and all refrigerator bottles are properly filled and available during emergency.

2. Now, to make sure of the total supply, make up the balance of what your family might need by storing fresh drinking water in glass jars or jugs with tight-fitting covers, caps, or stoppers. Water fresh from the tap is safe provided containers are clean. Pack your containers carefully.

3. You should not hoard large quantities of food under any circumstances - that would be wasteful and foolish. But you should have on hand at all times a normal 2-week supply. You may already have enough on hand. If not, and canned or dried food which does not need refrigeration. Don't forget powdered milk or condensed substitutes for fresh milk, and extra supplies of baby food.

4. Radioactive matter can make you sick if enough of it gets in your body, but even a cellophane wrapper may protect food from contamination if the wrapper itself remains unbroken. Food in your closed refrigerator, deep freeze, or cupboards will be safe, but uncovered food exposed in the open might not be.

After a nuclear attack wash or wipe clean any food or water container before opening it. Radioactive contamination on cooking or eating utensils is another problem. Such substances cannot be made harmless by boiling-they can only be washed away.

5. Flush-water toilets cannot be used during emergency especially when water services is interrupted and therefore the family should be provided with a covered container and a stockpile of plastic bags. This will solve our sanitary requirements during an emergency as regards emergency disposal of human waste, garbage and rubbish.

TREATMENT OF SUSPECTED WATER:

If and when potable water sources from taps are no longer available, water from open wells, rivers and even flood waters can be treated and used.

GETTING THE MUD OUT:

1. Take a pail of suspect water and thoroughly mix in half a teaspoon of powdered alum ('tawas"). Let stand for a few minutes. The

alum will cause the mud to form into bigger particles which will settle to the bottom.

2. Slowly pour off the water into another container, taking care that mud particles in the bottom is not disturbed.

3. The other containier should be covered with layers of cloth which serves as a strainer.

4. The strained water is less muddy or should be clear. Repeat procedure if necessary.

5. Warning: Water treated this way is not yet safe for drinking. It should be treated further in another manner to kill harmful germs and organisms that passed thru the strainer.

PURIFYING THE TREATED WATER:

1. Water treated as per procedure above can be purified either by boiling or chemicals.

2. If it is possible to boil the water, then boiling should be done. The boiling should be continued for at least 10 minutes. Let it cool. Then it is safe to use.

3. If boiling is not possible, such as in flooded areas, purification can be made by mixing one tablespoon of liquid household bleach which contain chlorine compounds. These "chlorox", "oldrox", etc. Vigorous and continuous stirring for several minutes is recommended in order to throughly mix the chemical into water.

Using such treated water may be repulsive to some people, but it is better than having no drinking water at all.

PRACTICE:

1. Gather your family together and discuss the dangers of dirt and disease which can bring illness or death following a disaster.

2. Make sure you know what you are going to do about household sanitation if an emergency occurs, and see that you have on hand the supplies you would need to protect your family's health.

3. Work with your neighbors to set up sanitary measures that will protect your area. Disease is no respecter of property lines.

DISASTER PREPARATION LESSONS

For Use in Schools in Western Samoa

Prepared by the Voluntary Organisations
Disaster Relief Preparedness Committee,
Western Samoa, 1982

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INTRODUCTION

The Voluntary Organisation Disaster Relief Preparedness Committee (V.O.D.R.P.C.) of Western Samoa has designed this unit for use in Samoan Secondary Schools as an aid for increasing student knowledge and understanding about disasters that they may face in their life-time. It is suggested that the unit be taught in the 3rd Form social studies classes but a school could use it at other times or in other classes as they see fit.

The unit has been designed with two major objectives in mind. Upon completion, the student should be able to:

1) Describe man-made and natural disasters and the dangers they present to people, families and communities; and

2) Describe actions which should be taken before, during and after disaster situations to preserve life and property.

An attempt has been made to include in each lesson as much discussion and activity as possible. It is suggested that teachers assist students with questions and hints, but whenever possible, to allow the students to come forward with ideas. This would encourage independent thinking on the part of the student which would be an important tool for them when faced with disasters be they by themselves, with their family or community.

ACKNOWLEDGEMENT

Many different people and organisations have contributed time, effort and materials in producing this manual. It would not be possible to mention all of them here but some merit special notice. Individuals from the Western Samoa Red Cross, United States Peace Corps, University of the South Pacific, Seventh Day Adventist Mission, Western Samoa Department of Education and the Church of Jesus Christ of Latter-Day Saints have all given much time and effort. Special thanks goes to Mrs Una Ward for the poster designs and illustrations. Invaluable material has been contributed by the Fijian Red Cross and the Pacific Islands Development Program.

A very special thanks goes to the Australian Government, without whose support and sponsorship, this manual would not have been possible.

INTRODUCTORY LESSON: WHAT IS AN EMERGENCY? HOW CAN WE PREPARE FOR IT?

CONCEPTS:

... Establish what an Emregency is.

... Understand and describe what a disaster is.

... What is preparedness?

METHOD:

Discussion -

Have you ever had an Emergency?

- What started it?
- What did you do?
- What happened in the end?
- How did you feel when it was over?
- Did it cause any change in your attitude/life?

Definition -

"An Emergency is an event which happens suddenly, and puts life or property in danger."

It needs quick action to save the people involved. If people get hurt or killed, the Emergency becomes a DISASTER. Something like a tree falling on your house will usually affect only you and your family. But sometimes an Emergency takes place which affects the whole community.

- Can you think of Emergencies which struck a family, a whole village, town. city or country? List on board.
  Example - Flood, fires, hurricane, earthquake, drowning, shipwreck etc.
- What effect did the disasters have on the people involved?
- What effect did it have on the property?
- What effect did it have on the community?

What is Preparedness?

Definition -

"Preparedness is being ready - knowing what to do in an Emergency

Child's Role in an Emergency -

- Keep Self-control.
- Be able to follow directions carefully.
- Be familiar with procedures for various emergencies.

Know how to get help if an emergency occurs and an adult is not present.

ACTIVITY:

Find out about the following disasters in Western Samoa's history and if possible, bring pictures or articles on disasters to the next lesson:

- Matavanu Eruption.
- 1966 Hurricane.
- 1982 Floods.

Can you name any other disasters in Western Samoa's history?

CONCLUSION:

How can you know that a disaster is occurring?

- LISTEN TO THE RADIO!
- APIA SIREN WARNING SYSTEM - (Through the Fire Brigade Department)
  - A Small fire - 1 whistle
  - Preliminary warning of an approaching disaster, e.g. Cyclone, Tsunami, Fire - An up-and-down wailing of the siren, 15 secs. up, 5 secs. down of long duration, i.e. 3 - 5 minutes.
  - Final warning of an immediate disaster - an up-and-down wailing of the siren, 5 secs. up, 5 secs. down of long duration, i.e. 3 - 5 minutes.
  - All clear - a long one pitch siren.
- POLICE WARNING SYSTEM -
  - Warning of an approaching disaster - car and motorbike sirens, similar to above - loudspeakers from Police vehicles.
- OTHER WARNING SYSTEMS -
  - Church or village bells rung very fast.
  - After 2AP has gone off the air, other Pacific stations may broadcast warnings on short-wave bands.
  - Black flag on top of clock tower.

FIGURE 1:

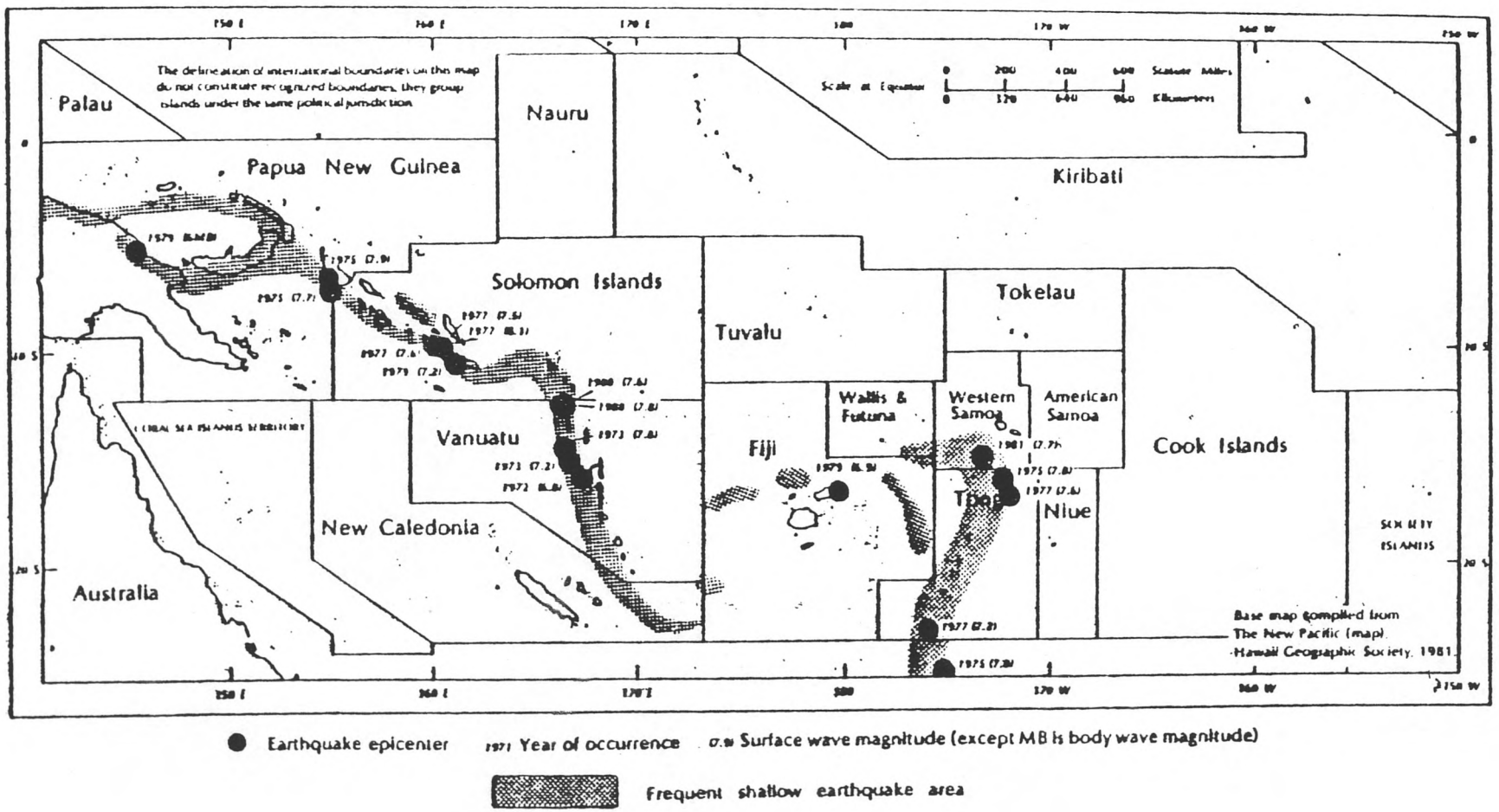


Figure 1. Significant Earthquakes in the South Pacific, 1972 to 1982. Data from Ganse and Nelson 1981 and Significant Event Altert Network Bulletin 1980, 1981 and 1982.

EARTHQUAKES AND TSUNAMIS

LESSON 1: WHAT HAPPENS DURING AN EARTHQUAKE? — WHAT EFFECTS DO EARTHQUAKES HAVE?

CONCEPTS:

... Understand what happens during an Earthquake.

... Know what effects Earthquakes will be in various areas and situations.

METHOD:

Discussion -

- What causes an Earthquake?

  Look at a map of the World or a Globe. Explain how the earth is covered by a "crust" similar to the skin of an orange, which is divided into pieces called "plates". Unlike the oranges however, the pieces of the crust are continually slowly moving. Earthquakes often occur at the end of these pieces. If a movement is large, sudden and near us, we feel it is an earthquake.

Definition -

"Earthquakes are earth vibrations caused by the sudden movements of large blocks of rocks in the earth's crust."

- Where is Samoa on the World map?
- Can you find any other countries on the map?

  Study and use the map (Figure 1) and relocate the epi-centre (centres) of recent earthquakes on your own world maps.

- How prone is Samoa to earthquakes?

  Explain that the earth's crust is very deep (30 kilo metres) and earthquakes may occur at any depth in that crust. The most damaging earthquakes are those of large magnitude in the top of the earth's crust.

Briefly mention the two types of Earthquakes.

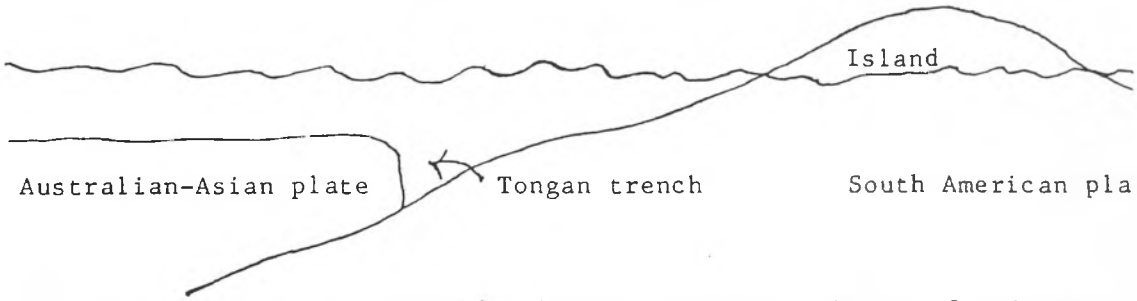
1) VOLCANIC - Often called Tremors - occur near the surface of volcanoes due to the movement of molten rock.

2) TECTONIC - The more common type, due to the movement of

relatively solid parts of the earth's crust pushing against each other occur along weak zones called 'Fault Lines'.

FIGURE 2:

TONGAN TRENCH FAULT LINE:



The Tongan Trench is one of the deepest points of the Pacific Ocean. It extends from Savaii through the Tongan Islands. It is the place where the plate of land that includes Australia, New Zealand and other islands meet the plate of land, including South America.

These plates are constantly pushing at each other. Occasionally, one plate moves, causing a tectonic earthquake which will be felt anywhere along the trench, including Samoa.

A destructive earthquake generally reaches its peak of violence within seconds of the first shaking. The largest 'after-shake' is usually less severe than the main shock, but may do serious damage to structures that have already been weakened.

What might happen if there is a major earthquake?

- Discuss student answers.

Ideas -

- Land breaks up - rockfalls and landslides.
- Buildings wrecked.
- Broken powerlines, branches from trees, falling coconuts etc.
- Fire where gas or electricity supplies are broken.
- Normal services unable to work.

What happens if people panic?

ACTIVITY:

Discuss earthquakes that you can remember.

What effect did the quakes have on the people involved?

LESSON 2: HOW CAN WE PREPARE FOR AN EARTHQUAKE?

CONCEPTS:

... Preparing for an Earthquake at school.

... Preparing for an Earthquake at home.

METHOD:

Discussion -

What should be done in case of an earthquake?

Decide on some signal (a special word, whistle etc.) to use to convey to the students that they must take cover immediately. The drill for this must be practised during the year so that ALL students learn to respond to it automatically.

DRILL INSIDE CLASSROOM -

EITHER - Get under a desk or table

OR - Drop to knees with back to any windows and with knees together

THEN - Clasp both hands firmly behind the head covering neck
- Bury face in arms, protecting head, close eyes tightly.

Stay in this position until instructed it is safe to move. REMEMBER the greatest immediate danger is from falling objects.

EVACUATION
- If this is necessary, a prepared route to the evacuation point should be used. Supervise the exit of students. Make sure this is done in an orderly manner.

STRESS - DO NOT PANIC!

Make a roll call at the evacuation point to ensure all children have reached safety.

P.S. It is the teacher's responsibility to make sure that students are sent home safely.

DRILL OUTSIDE -

- Stay in the open, away from large trees and palms.
- Keep away from buildings and power lines.
- Beware of falling electricity wires.

DRILL IN A CAR OR BUS -

- Stop in an open area, never on a bridge.
- Stay inside the vehicle!

DRILL INSIDE HOME -

- Seek cover under heavy furniture e.g. bed, table, doorway.
- Stay in safety position.
- If in Samoan fale, go outside to an open area.

NO OUTSIDE MOVEMENT SHOULD BE MADE UNTIL EARTHQUAKE MOVEMENT HAS COMPLETELY STOPPED.

ACTIVITY:

- Choose a safe place for assembly after evacuation.
- Review drills to make sure everyone knows WHAT to do and WHEN to do it.
- Practise drills at unexpected times.

LESSON 3: HOW ARE TSUNAMIS CAUSED? WHAT SHOULD WE DO?

CONCEPTS:

... Understanding of causes of Tsunamis.

... Know what to do when a Tsunami is expected.

METHOD:

Discussion -

- Explain that we may always expect Tsunamis after a strong earthquake. It can occur at sea or in a coastal area.

Definition -

"A Tsunami is a series of travelling ocean waves of extremely long length and period caused by earthquake."

A Tsunami can be anywhere from 1 foot to 50 feet high. The water may not recede for several hours. Tsunamis are more dangerous in shallow water near coastal lines.

- What are the effects of a Tsunami? (Example: On people living in coastal areas, people in boats and people inland.)

  A Tsunami is dangerous within half a mile inland of the coast and at areas which are less than 50 feet above sea level.

... After a large earthquake, do not stay in low lying coastal areas, make for higher ground.

... If a first wave is small, remember that bigger ones may follow.

... Approaching Tsunamis are sometimes noticed as a RISE and FALL of coastal water - This is Nature's warning. If the water suddenly goes out of the reef RUN TO HIGHER GROUND.

DO NOT GO DOWN TO THE BEACH TO WATCH FOR A TSUNAMI.

WHEN YOU SEE A WAVE YOU ARE TOO CLOSE TO ESCAPE!

ACTIVITY:

... Look at the map in Figure 1. How likely is it that Samoa could be affected by Tsunamis?

... Discuss Tsunami Poster with students.

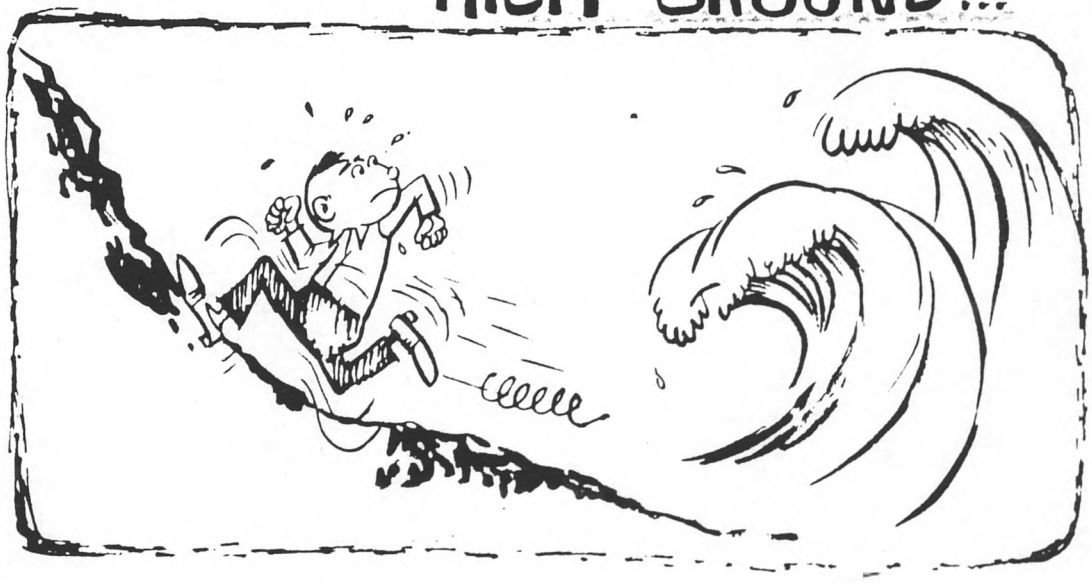
TSUNAMI - TIDAL WAVE

IF AN EARTHQUAKE OCCURS.....

SUCH THAT YOU MUST HOLD ONTO SOMETHING TO KEEP YOU FROM FALLING ...

THERE MAY BE A "TSUNAMI"

SO HEAD FOR HIGH GROUND...



FIRE

LESSON 1: WHAT FIRE IS.

CONCEPTS:

... Fire needs three essentials to burn: FUEL, OXYGEN, HEAT.

... Fires can start very rapidly e.g. Gas explosion or very slowly e.g. smouldering.

... Burning materials produce : Smoke, Gases, Heat, Flames.

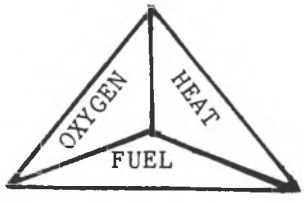
... Fires can spread very quickly through : Flame contact, Radiation, Conduction, Sparks and Brands.

METHOD:

Discussion -

"A Fire cannot burn if there is no fuel, heat or oxygen. If any one of these three is missing, the fire will go out."

Explain the above to the students and illustrate it on board by drawing the "Fire Triangle."



Explain to the students that there are three classes of fuel namely -

(A) Wood, Clothing, paper etc.
(B) Liquids and Gases - Oils, Kerosene etc.
(C) Electricity.

ACTIVITY:

(The teacher may use one or the other or both).

... AIM - To show students that fire needs oxygen to burn.
EQUIP-MENT - Empty jar and lid, candle, matches.
METHOD - Talk about the fact that air is in the jar. Air is made up of many gases (including oxygen, carbon-dioxide, nitrogen and also water vapour).

Place candle in jar and light it. Place lid on jar and screw on tightly. (Flame will go out as oxygen is used up.) Ask students why flame has gone out. Repeat procedure and let students try.

... AIM - To show students that fire needs heat to burn.
EQUIPMENT - Dry wood, paper or substitute, matches.
METHOD - In an appropriate area outside the school building, pile up dry wood and start a small bonfire.

Wait until wood is burning well. Pour sufficient cold water over burning wood until fire is completely out.

Ask students why fire died out.

CONCLUSION:

Refer again to the "fire triangle" and the things needed for fire to burn.

What are some things that could be used to put out a fire? (Examples : Soil, sand etc.)

LESSON 2: WHAT SHOULD WE DO WHEN THERE IS A FIRE AT HOME/SCHOOL

CONCEPTS:

... If there is a fire at home we should know what to do immediately.

... We must learn and remember what to do when we are at school and are alerted to a fire.

METHOD:

Discussion -

HOME SITUATION

- Discuss with students what material their homes are made of and how this will affect the fire.
- Discuss how the shape/design of a house may affect a fire (e.g. multiple-stories, exits, stairways etc.).
- Discuss best escape routes - low windows, doorway.
- Discuss what to do upon discovering a fire:

  ... Alert parent/rest of family.
  ... Memorise and call FIRE SERVICE - TELEPHONE EMERGENCY NUMBER 999 - GIVE EXACT LOCATION and EXTENT OF FIRE.
  ... Move outside if possible.
  ... If you cannot get out - DO NOT PANIC!

- DO NOT JUMP FROM HIGH PLACES. STAY BESIDE AN OPEN WINDOW AND YELL FOR HELP.

SCHOOL SITUATION

- Establish with pupils what the school signal for Fire is (e.g. The continuous ringing of a bell).
- Upon hearing the fire signal, all students must immediately stop what they are doing and proceed with the drill which has been practised. The fire will be put out by adults and/or the Fire service.

DRILL

- The accepted drill for each school must be practised at intervals throughout the year.
- Establishment of an escape route.
- Establishment a FIRE ASSEMBLY POINT. This should be clear from the school buildings.

- Roll call by each teacher. The teacher must have the students register at the Assembly Point to check that all students are accounted for.
- Students and teachers remain at the Assembly Point until the OKAY is given by the Headteacher.

ACTIVITY:

- Discuss the 1982 Tivoli Fire or any fire that you know of.

  What was the construction material?
  What type of building was it? (Theatre, office, home, factory, etc.)
  What was the suspected/identified cause(s) of the fire?
  Was the building a fire risk? If the answer is Yes, explain why.
  How could the fire have been prevented?

CONCLUSION:

It is essential that the students' reactions to fire be automatic, both in the classroom and at home.

CYCLONES

LESSON 1: WHAT IS A CYCLONE?

CONCEPTS:

... Not all cyclones are alike but there are some similarities which we can see.

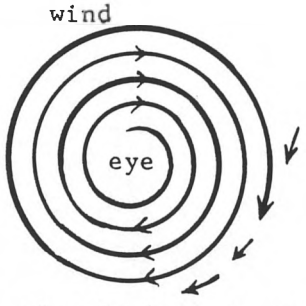
METHOD:

Discussion -

- What is a Cyclone?

  - Explain that Cyclones, Hurricanes and Typhoons are different names for the same thing.
  - Write and illustrate on board.

  Cyclones are tropical storms in which winds reach speeds of over 74 miles per hour (120 kilometres per hour) and blow in a large circle around a calm centre or "eye".



Direction of movement SW

Diagram of a Cyclone in the South Pacific.

  - Explain that in the South Pacific, cyclones circle in a clockwise direction and move forward toward the Southwest at speeds of 15-60 mph. Very little is known about what makes cyclones move and at this time, it is difficult for scientists to tell exactly where a cyclone will hit land. Therefore, they are always dangerous as they can change direction without warning.
  - Have any students been in a bad storm? (i.e. floods of 1981)
  - What was it like?
  - How did they feel in a storm?

- What is the eye of a Cyclone?

  Write on board.

The eye is usually 10-20km across and is made up of light winds and fair weather. However, it is surrounded by the strongest winds of the cyclone. If the eye passes overhead, the winds and rain will stop and it will seem as though the cyclone has passed. However, strong winds should be expected coming from the opposite direction. (Teacher can point this out in the diagram). Many people have been injured or killed when they went outside during the eye thinking that the Cyclone had passed.

- Have students describe what they think the eye of a Cyclone might be like.
- Why is it dangerous to go outside while the eye is passing overhead?

- What is a Storm Surge?

Write on board.

- A storm surge is a fast rise in the level of the sea which is caused by a Cyclone. A storm surge is not a wave. It is a large wall of water which rises as high as 65 feet above the normal level of the sea and is pushed along by the cyclone moving in the same direction as the cyclone. A storm surge is more dangerous at high tide. It will move inland until it gets to the place where the ground is as high above sea level as the top of the storm surge.
- Explain that if a storm surge is 20 feet high it will continue to move inland until it reaches a point where the land is 20 feet above sea level.
- What damage could a storm surge do?
- Why is it important to get to higher ground?

- How long will a Cyclone last?

The high winds and rain of a Cyclone can be felt for over a week after the Cyclone strikes.

- When can we expect Cyclones?

Cyclones can come at any time of the year but they usually come from November to April.

- Why do we give them names? (For easy identification).

ACTIVITY:

Interview -

Have students interview someone in their family who remembers the Cyclones of 1966, 1968 and 1974 in Western Samoa. What was it like? What happened to buildings, roads, plants and people? What did the person do during the storm?

LESSON 2: HOW DO WE KNOW A CYCLONE IS COMING? WHY IS A CYCLONE DANGEROUS?

CONCEPTS:

... Radio is the best way to get information about Cyclones.

... Cyclones are very dangerous in many ways.

METHOD:

Discussion -

- How do we know if a Cyclone is coming?

- Write on board.

LISTEN TO THE RADIO! The radio will give important information about if, when and where the Cyclone will hit. You can also find out what you should do during the storm.

- Discuss with students.

Turn on the radio and leave it on throughout the storm. It is difficult for scientists to know exactly where a Cyclone will go, but any information they have will be on the radio. This is one of the most important things you should do during a Cyclone.

LISTEN TO - The Radio
- Siren Warning System.
- Megaphone (patrolling Police cars)
- Some villages use the bell warning system.

- Why is a Cyclone dangerous?

- Introduce and explain to students:

Cyclones can be very dangerous. 120mph winds can do great damage to houses and buildings. Rains, floods and storm surges can damage houses, roads, water-pipes, electric wires, animals, boats, plants and people.

- Can you think of some of the bad things that would happen during a hurricane?

Let's start with the houses -

- What would happen to a house during a Cyclone with 120mph winds?
(Note: The following are some things that might happen. The students may think of other things and not these. That's fine. These are just some ideas.)

1) Houses and Buildings

(a) Roofs blow off.
(b) Walls blow over.
(c) Objects fly around.
(d) Windows break.
(e) The house can be lifted by the wind.

2) Roads, Pipes, Wires, Communications

(a) Floods ruin roads.
(b) Bridges washed away.
(c) Water pipes break.
(d) Electric wires fall.
(e) Phones and radios go out of order.
(Hurricane Isaac in Tonga, in 1981 caused $10 million in damage to buildings, roads, etc.)

3) Plants and Crops

(a) Above ground crops (coconut, breadfruit, etc.) blow down.
(b) Below ground crops (taro, yams) are ruined by floods.
(c) Export crops ruined (Isaac caused $9 million in crop damage.)

4) Animals

(a) Dogs, cats, chickens and pigs drown.
(b) Fish are scared and are hard to catch.
(c) Fishing boats are destroyed by rough seas.

5) People

(a) Injured or killed by flying objects, floods, falling buildings etc.

- 1970 : East Pakistan - 300,000 killed by a 65 ft. storm surge.
- 1900 : U. S. A. - 6,000 killed by a storm surge.
- 1973 : Fiji - 72 killed in a boat during a storm surge.

Samoa

- 1899 : 143 people killed in Apia Harbour.
- 1966 : 10 killed on Upolu, 25 others in Tutuila.
- 1974 : Several died in a landslide in Falevao caused by a Cyclone.

CONCLUSION:

Hurricanes destroy buildings, roads and food and kill animals and people. After a storm, it is very difficult for people to find shelter, clean water and food. It costs people and Governments millions of dollars to recover from a bad Cyclone.

ACTIVITY:

Unscramble these words.

1.	Ortsm	(storm)	8.	rtaew	(water)
2.	yee	(eye)	9.	carierhun	(hurricane)
3.	lofod	(flood)	10.	tlpans	(Plants)
4.	sifh	(fish)	11.	aegmda	(damage)
5.	nocleyc	(cyclone)	12.	ilkl	(kill)
6.	ordsa	(roads)	13.	rsugremtso	(storm surge)
7.	doiar	(radio)	14.	elppeo	(People)

LESSON 3: HOW CAN WE BEST PREPARE FOR A CYCLONE?

CONCEPTS:

... There are many things we can do now which will make our homes safer if a hurricane should come.

... When a hurricane is coming, we must know what to do.

METHOD:

Discussion -

Introduce and explain to students:

- You cannot stop a cyclone. But you can be prepared for one that comes. There are things that you can do before, during and after a Cyclone to keep yourself and others safe. What things can you do, long before a Cyclone to make your house as safe as possible?

BEFORE THE CYCLONE SEASON

- Check your house to make sure it is strong, particularly the roof. Wood should be dry and termite free.
- Keep tree branches away from wires and windows. (If necessary, call E.P.C. to assist.)
- Take away rubbish from the yard especially large pieces of tin.
- Take down all buildings which are no longer used and which are not strong (e.g. old fales).
- In case of a storm surge, know of a nearby high safe area.
- Make sure your home has an Emergency kit.
  This should contain - A battery operated radio, spare batteries, tinned food, bottled water, torches, candles, matches and essential clothing.
  - First Aid kit, bandages and medicine.

WHEN A CYCLONE WARNING IS GIVEN

- Listen to the Radio.
- Board or tape up windows and doors, tie down loose objects, tie down roof overhangs, board up spaces under a house where the wind can get under and lift the house.
- Turn off the main electric switch.
- If your house is in a low lying area, move yourself, family and livestock to higher ground. Move out of any weak house or house on stilts.
- Store as much drinking water as possible in clean tubs, buckets, bottles etc..
- Check your Emergency kit - especially batteries, candles, matches and tinned food.

WHEN THE CYCLONE COMES

- DON'T PANIC! Stay indoors.
- Keep away from beaches or low lying coastal areas.
- Shelter yourself in the strongest part of the house.
- Beware of the eye. Remain indoors as strong winds will quickly blow from the opposite direction when the eye passes. Stay inside until the radio says the storm has passed.

AFTER THE CYCLONE

- Watch out for fallen electric wires and report them to the Pulenuu.
- Boil drinking water.
- Beware of flooding from quickly rising rivers.
- Watch for broken glass and nails sticking out of wood.

CONCLUSION:

Listen to the radio, use common sense and do not ignore warnings!

ACTIVITY:

Write a story about what you would do at your home if you knew a storm was coming. How would you prepare? What would you do during the storm?

OR

Draw a picture of your home before a cyclone. Draw another picture of what you would expect it to look like after the storm.

FLOODS

CONCEPT:

... When a Flood comes, we must know what to do.

METHOD:

Discussion -

- Causes and effects of Floods.

Discuss with students:

- What caused the Floods of 1982? (Heavy continuous rain).
- What are some of the things that may happen during a Flood? (List on board).
  Examples -
  - People stranded in an area, unable to get home because of high water.
  - People and animals drowning.
  - Flooding in house, damaging building and contents (food and clothes).
  - Danger from things being carried in the water (e.g. uprooted trees, rocks, mud).
  - Danger of being swept away.
  - Danger of disease (typhoid, dysentry) from dirty water.

Homes and schools that are near streams, rivers and coasts are more likely to be flooded. Remember that storm surges and Tsunamis cause floods.

- What should we do when a Flood is coming?

When a Flood warning is received in your area (Radio, bell, word of mouth, etc.) prepare to leave your home. Teacher's note - Have students come up with as many suggestions as possible.

- Make your home safe by:

  - Closing windows.
  - Storing things high up.
  - Securing any loose materials (e.g. wood, tin etc.)
  - Turn off all power, gas, lights, stoves etc.
  - Upon instructions from a responsible person (Pulenuu etc.) move to high ground or a pre-arranged evacuation point.
  - Take only those things which you will need overnight and which you will easily carry (e.g. mat, blanket, clothing, food, clean water.)

- STAY CALM.
- DO NOT TRY to cross a flowing stream, where water is above your knees. This is especially dangerous at night.
- DO NOT SWIM in flood waters. Diseases (cholera, typhoid) are easily spread in dirty flood waters.
- DO NOT go back to your home until advised to do so by a responsible person.
- After the flood, dig up any root crops (taro, yams, etc.) or else they will rot.
- Plant quick growing crops (e.g. taro, beans, cabbage) to feed the family as soon as possible.

CONCLUSION:

One of the most important things to remember is to STAY CALM. If you follow directions given by responsible persons and if you use common sense, the flood need only be a temporary set-back.

ACTIVITY:

Write a story about your experience in the flood in 1982. How could you have been better prepared for the flood?

ANNEX 1:

ACTIVITY SHEET:

Teachers may select any of the following additional activities for inclusion into the appropriate lessons or as additional homework which the students could do after school hours.

1. TALK to someone in your community who has been involved in an Emergency/Disaster. Make a brief report on the event and its effects.

2. DESIGN a Poster showing what a family needs to be prepared for an Emergency.

3. BASEBALL (This is a very good revision activity - requires a full period.)

   Method -

   (a) Divide the class into two equal teams.

   (b) Lay out 4 "bases" in different corners of the room - Home, First, Second, Third.

   (c) Team 1 is up first. Ask the first player any revision question about hurricanes. (Example: "How big is the eye of the hurricane?")
   If the player answers correctly, he goes to the first base. If he answers incorrectly, he is out.

   (d) When there are three "outs", the other team has their turn.

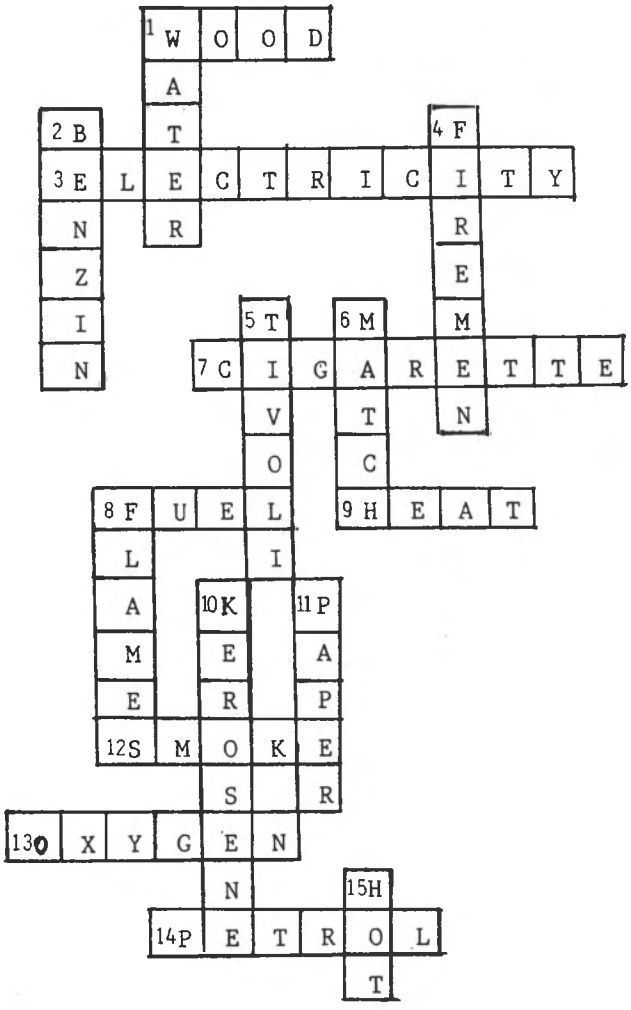
   (e) A player moves from first to second base if the next batter answers correctly. When any player reachers second, third, then home base, that team scores one point.

   (f) When asking a question, all other students must be absolutely silent. No one can shout out answers. If someone shouts out or misbehaves, their team loses one out the next time they have a turn (i.e. they only get two outs for their turn.)

4. ACTIVITY
   Perform and practise the STOP, DROP AND ROLL technique to put out flames when clothing is on fire.

Method -

Stop immediately wherever you are, indoors or out. Drop quickly to the ground. Cover face with hands to prevent flames from reaching the face area. Roll over and over to smother flames. DO NOT RUN. Running will increase the flames. If you can wrap yourself in a rug, blanket, large towel or bedspread while rolling, it will help smother the flames. DO NOT RUN to get something to roll in as flames will burn more rapidly as you run. Make sure flames are out before removing your clothes, and never remove clothes over your head.



ACROSS:

1. Most Samoan houses are made of this material.
3. This gives people energy for light to use an iron, oven etc.
7. A person who smokes this may cause a fire if they are not careful.
8. Fire needs this to burn.
9. Fire needs this to burn.
12. This rises up when there is fire.
13. Fire needs this gas to burn.
14. Cars use this to move.

DOWN:

1. Firemen get this out of pipes and hoses to put out fire.
2. In places where there is no electricity people use this for light at night.
4. These people work to put out fires.
5. An Apia movie theatre which got burnt down.
6. Smokers use this to light their cigarette.
8. Fires produce this when they burn.
10. People use this for fuel for their cooking.
11. Student books are made of this material which could easily catch fire.
15. When there is a fire, do not open the door if it feels like this.

ANNEX 2:

EXAMINATION QUESTIONS (Optional)

A. 1. What would you do with the following in an Emergency?
- Radio
- Telephone
- Electricity mains

2. List five types of Disasters.

3. a) Name the 2 types of earthquakes.
b) Which is the more common type?

4. Describe what you would do if an earthquake happens while you were in the classroom.

5. After a strong earthquake, what other disaster can you expect?

B. 1. List 3 things which are needed to start a fire.

2. a) Name 3 common causes of fire in the home.
b) Explain how these fires could be put out.
c) Explain how these fires could have been prevented.

3. What telephone number should you always remember to call if there is a fire?

4. a) Explain why it is important not to run when your clothes catch fire.
b) Explain why it is important to make sure that flames are put out completely before removing your clothes.

C. 1. Draw a simple picture of what a hurricane looks like from above. Show the direction of the winds, the eye and the direction that it moves. (See Figure 2 in Lesson 1 on Earthquakes and Tsunamis.)

2. What is a storm surge and why is it dangerous?

3. How can you find out if a Cyclone is coming?

4. List 5 things that hurricanes destroy or damage.

5. List 1 thing that you can do to protect your house and your family:

   a) Before a Cyclone.
   b) When you know a Cyclone is coming.
   c) When a cyclone strikes.
   d) After a cyclone strikes.

D. 1. List 5 dangers of floods to people and livestock.

2. Describe how you would prepare your home when you know floods are about to happen.

ANNEX 3:

RESOURCE LIST:

Resource materials listed below plus numerous other references are available for perusal and study at the Western Samoa Red Cross Headquarters, Saleufi. The list would be reviewed and added to regularly as more resources are at hand (including films).

... Set of 5 small size posters on each type of disaster.

... Set of 2 large size posters (Disaster information and pictures.)

... Disaster Management in Western Samoa. Office of the United Nations Disaster Relief Co-Ordinator (UNDRO) Technical Advisory Mission to the Government of Western Samoa (12 May - 12 June, 1982).

... Apia Observatory: Tide Table, Solar and Lunar Data. (Sections on: Tropical Cyclones and Local earthquakes and Tsunamis) 1982.

... Apia Observatory: Report on the storm and floods of February 3 - 9, 1982.

... Apia Observatory: Tsunami Report 31 August, 1981.

... V.O.D.R.P.C.: Report on the Seminar on Natural Disaster, Nukualofa, Kingdom of Tonga (November 1 - 5, 1982).

... World Meteorological Organization "Tropical Cyclones" (paper only).

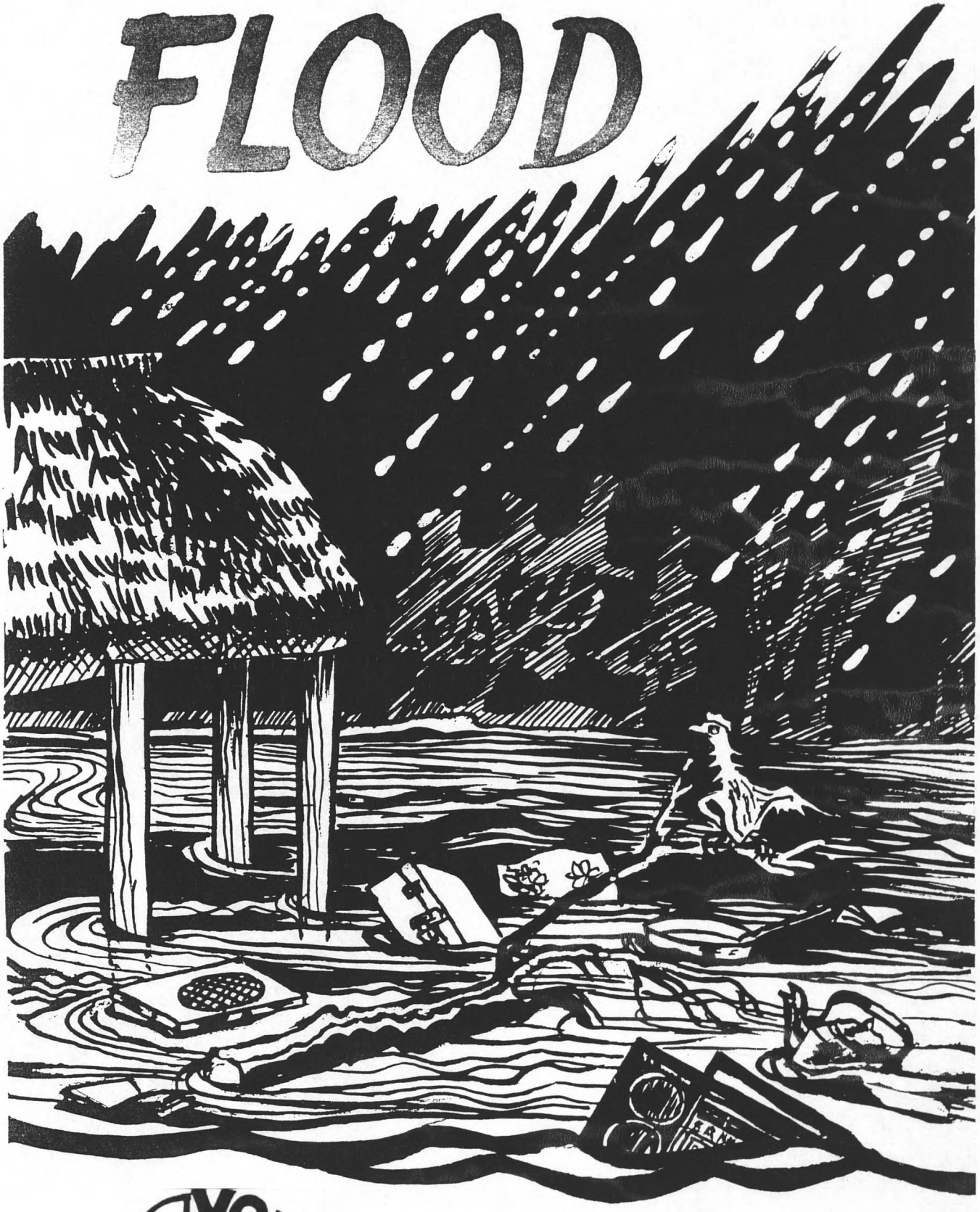
... Volcanic Risks in the Pacific Area - outline. Paper by Gordon A. Macdonald, Volcanologist, Hawaii. Institute of Geophysics.

... The threat of Tropical Cyclones in the Southwest Pacific. Paper by J.F. Gabites.

... Disaster Preparedness Lessons for Schools - Fiji - Fiji Red Cross Society.

... P.I,D.P. (Pacific Islands Development Programs), Hawaii. Disaster Materials.

FLOOD



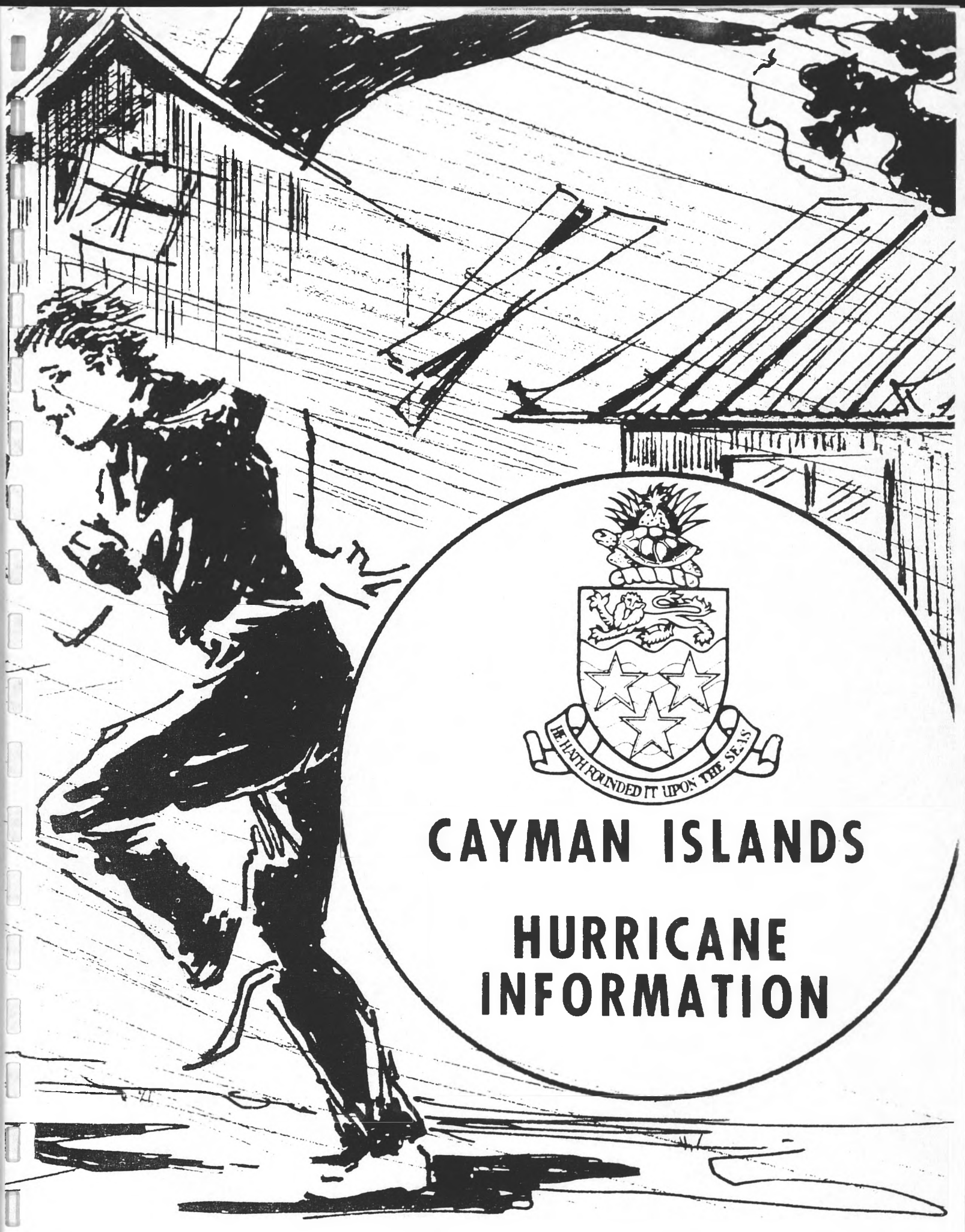
VODRPC

TIDAL WAVE

ASIOSIO

BEWARE CYCLONE

VODRPC



CAYMAN ISLANDS

HURRICANE INFORMATION

HURRICANES

THE HURRICANE SEASON

The hurricane season in the Caribbean area begins June 1st and ends November 30th each year. However, precautionary measures for the protection of lives and property against hurricanes, floods, tidal waves and other inclemencies of the weather, should not be taken only during the dates previously mentioned, but also throughout the year. Natural disasters can and do occur at any time of the year. Precautionary measures require immediate action when the danger of disaster is imminent, and at other times when the anticipated action will avoid disastrous results.

WHAT IS A HURRICANE

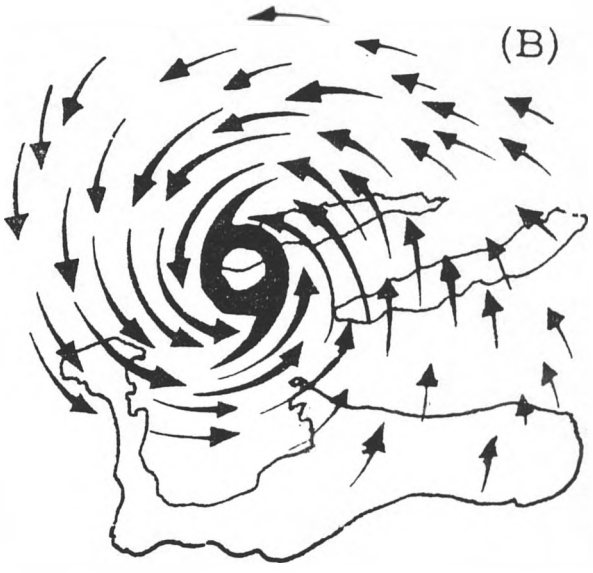
A hurricane is a revolving storm of tropical origin, accompanied by winds of 75 or more miles per hour, which circulate around a centre or vortex of lower barometric pressure in a counter clockwise motion. When the intensity of the winds does not reach 75 miles per hour, wavering between that figure and 40 mph, then the phenomenon is termed TROPICAL STORM; under 40 mph, then it is called TROPICAL DEPRESSION.

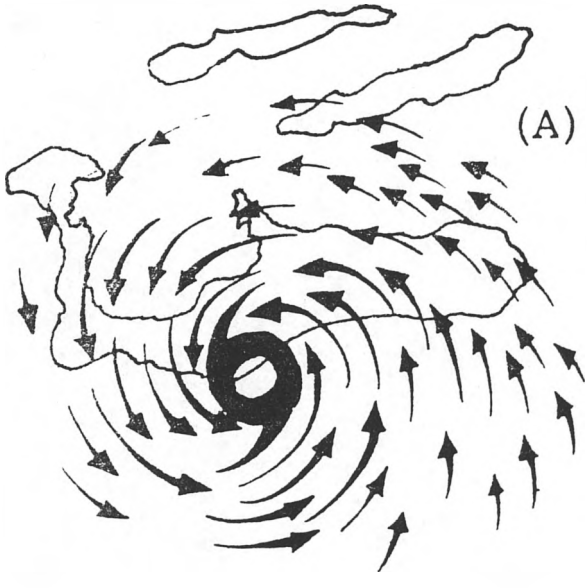
During the hurricane, tidal waves can be produced. These are movements of the waves of the sea produced by the force of the wind and then HURRICANE

TIDES which are abnormal and extremely dangerous, caused by atmospheric pressure.

EYE OF THE HURRICANE

One of the rarest and most striking phenomenom in a hurricane is the eye or vortex, whose diameter can vary between 10 and 40 miles. In well developed eyes, rain ceases completely, the sky is partially clear and the wind is reduced sharply to less than 15 mph and there can even be total calm, making the sun or the stars visible.





These diagrams show the direction or rotation of the winds in a hurricane. For example, if the centre or vortex is to the south of the Cayman Islands, the winds will blow from the East and N.E. as is indicated in A; and if the centre or vortex is to the N the winds will blow from the W & S.W. as shown in B.

FORMATION AND PATH

The chief areas for the formation of hurricanes in the Northern Hemisphere are (a) South of the Atlantic Ocean, (b) the Caribbean Sea and (c) the Gulf of Mexico. In the Atlantic and in the Caribbean Sea, the tropical storm and hurricanes generally move towards the West, although the route can vary according to atmospheric conditions. The most common route is towards the W. and then curve back towards the N. or N.W.

INFORMATION TO THE PUBLIC

The National Meteorological Service of Jamaica is the official source of information as regards hurricanes and other atmospheric phenomena which can affect the Cayman Islands. This Department keep constant watch over the

weather conditions in the area and inform the Cayman Islands Government who by use of Radio Cayman inform the public.

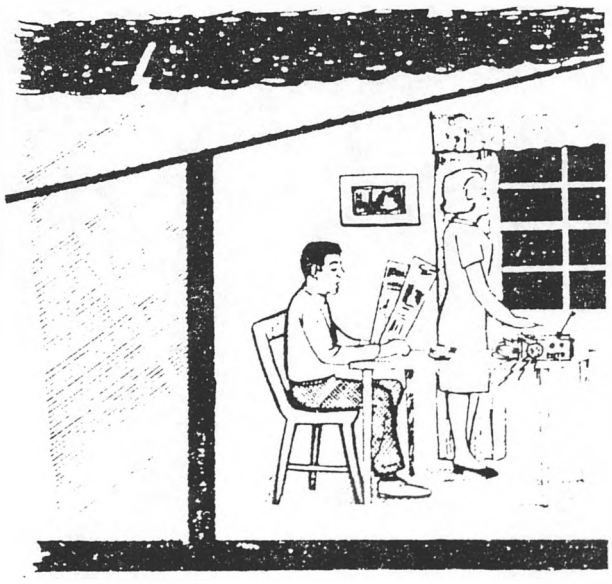
Everyone should keep tuned to the radio to find out the latest official news and should pay no attention to rumours. .

TYPES OF BULLETINS WHICH WILL BE PUBLISHED IN THE EVENT OF A STORM OR HURRICANE

1. Warning
2. Watch
3. Danger warning

1. Warning

The Warning is a special Meteorological bulletin which is published when a Tropical storm or hurricane has been formed over the sea even without there being any danger to the country. It is very important for navigation, and in it the location, intensity, speed of movement, and the probable path of the phenomenon are mentioned.



2. Watch

This type of bulletin is issued when a Tropical storm or hurricane threatens the Islands. It does not mean that there is immediate danger but the populace must be prepared in case the situation becomes serious and must keep tuned to the radio to hear the latest bulletins.

3. Danger Warnings

This is the type of bulletin issued when the danger of a Tropical storm or hurricane is imminent, to inform the populace that the country will be affected by one of these phenomena, strong winds and tidal waves being expected. Extreme precautionary measures must be taken immediately to protect lives and property.

ADVICE TO THE PUBLIC

Almost always we forget the dangers of a hurricane and how to protect ourselves until we receive the warning that one is approaching. It is very important to be always ready to protect ourselves from hurricanes since they can occur at any time and generally there is not much time to get ready when the approach of a hurricane is announced.

DO NOT pay attention to the old saying that when there is thunder there is no cyclone: it is completely false. The two things can happen simultaneously.

WHAT YOU SHOULD DO BEFORE THE HURRICANE SEASON

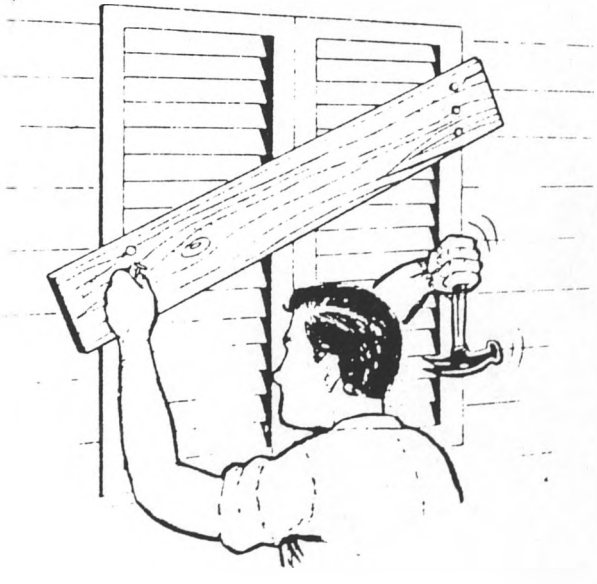
1. Carefully check your house and carry out repairs which may provide greater resistance in the event of a hurricane.
2. Be prepared to protect your animals and farm equipment.
3. If you live out of town, find out about the shelter which has been assigned to you and about how you can get there to avoid being marooned in the event of flooding.
4. Keep in touch with the authorities in your area.

DURING THE HURRICANE SEASON

As soon as the hurricane season begins you should pay attention to all the information published, in order to know all the facts regarding the formation of tropical storms and hurricanes. Rumour cannot be regarded as news and the relevant information should be obtained from official sources.

WHAT TO DO WHEN THE HURRICANE WARNING IS GIVEN

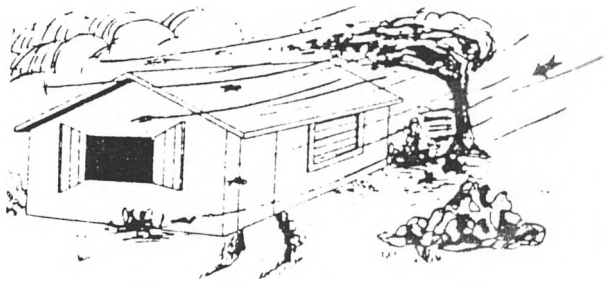
1. Do not pay attention to rumour. Stay tuned to your radio and listen to the bulletins issued by Radio Cayman. Do not make unnecessary telephone calls.
2. Stay away from beaches and other low areas which can be swept by the sea and hurricane tides.
3. If your house is out of danger of tidal waves, that is the best place to spend the hurricane. On the other hand, be prepared to remove to the shelter designated to your area.
4. Fasten and secure doors and windows, especially the outside, using good wood.
5. Put away all objects which can be blown away by wind, such

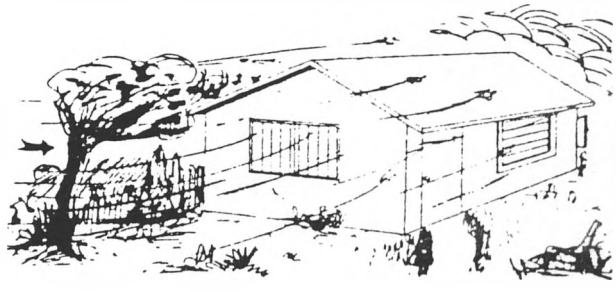


as furniture, flowerpots etc., since they can be destructive weapons during the hurricane. Clean your yard.

6. Stock up with foodstuff which does not need to be cooked - enough for not less than 3 days. If there are children in the family, get tinned milk to last for a similar period of time.
7. Keep a supply of drinking water. Get a first aid kit, lanterns or gas lamps. Do not forget that water supply and electricity can be disrupted unexpectedly.
8. In the case you or any member of your family is ill, get in touch with the medical authority right away before going to the shelter.
9. Keep handy pieces of cloth to clean the house, and cork the holes with pieces of rag or paper since the water from the rain can enter the house.
10. Keep a full tank of gasoline in your car.
11. Avoid taking alcoholic drinks.

WHAT TO DO DURING THE HURRICANE





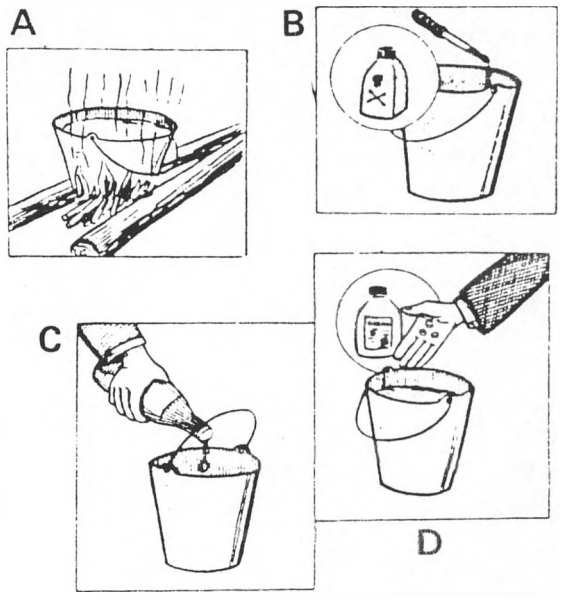
1. Do not leave your house or shelter during the hurricane.
2. Open one of the windows or doors of your house on the side opposite to the one from which the wind is blowing. Remember to close the same door or window as soon as the direction of the wind changes and open another, contrary to the new direction. This is recommended as a means of balancing the pressure inside and outside the house, so that the difference in pressure does not tear away the doors and windows.

3. If the centre, eye or vortex of the hurricane passes directly over your area, there will be a brief lull in the winds which can last from several minutes to ½ hour or more. Remain in a safe place during this lull. Make emergency repairs if necessary, bearing in mind that the wind will return suddenly from the opposite side and with greater force.

WHAT TO DO AFTER THE HURRICANE

1. Obtain medical help from the hospital for persons injured during the hurricane.
2. Collaborate with the Police and other authorities, giving all the information and help required.
3. Do not touch fallen electric wires. Inform the relevant authorities or the nearest Police Station of whatever damage to the wires.
4. Help the Sanitary Authorities (Public Health Department) in the campaign against epidemics by cleaning your yard. Do not throw garbage, rubbish, waste food or dead animals in the street. Help to protect the health of your community.
5. Do not exhaust your reserve of drinking water until the water supply has been restored. Do not take water from wells without boiling or purifying.
6. When driving cars, do so carefully as there might be debris on the streets and roads. On the roads, especially along the coast, be extremely careful since the sub-soil may be undermined and the paved surface can give way when a vehicle passes.
7. If you cannot give emergency help, stay far away from disaster areas since you can obstruct the rescue operations.
8. Be careful in handling flammable objects.
9. Keep calm. Do not panic. Your ability to cope with emergencies will serve as an inspiration and help to the others.

FOUR METHODS OF PURIFYING WATER



a. Boil the water for 5 to 10 minutes.

b. Add Iodine — 2 to 3 drops per litre.

c. Add Chlorine according to the manufacturers' instructions.

d. Purifying tablets according to the manufacturers' instructions.

TIDAL WAVES

Tidal waves are strong movements of the waves of the sea caused by the wind and by the sudden changes of atmospheric conditions. They occur frequently during winter and also accompany the hurricane season. They are very dangerous and those persons who live along the beaches or who own small boats should pay attention to the warnings of the Meteorological Service.

SPECIAL INSTRUCTIONS WHEN TIDAL WAVE WARNINGS ARE ISSUED

1. Do not go to the sea.
2. Seek shelter for your boat.
3. If you live near the sea, be prepared for possible evacuation.

GENERAL INSTRUCTIONS

1. Pay attention to the warnings issued by the Meteorological Service.
2. If you own a boat, have everything ready to protect it, whether it is out at sea or in the harbour.
3. Know the backwater areas and shelter spots in your area.
4. If you live by the sea, keep your house in a suitable condition to resist the onslaught of rough winds.
5. If you are aware of possible tidal waves and live near the sea, make preparations for possible evacuation, collecting useful items of property and removing them to safer places. Be ready to remove with your family to the designated shelters.
6. Know the shelters for your area.
7. Have a First-Aid Kit.
8. Have lanterns or gas lamps.

RULES

1. Do not leave your house during an electrical storm unless it is necessary.

2. If you need shelter, choose it in the following order:
   a. houses or buildings which are protected by lightning conductors.
   b. big buildings without protection
   c. small buildings without protection
3. Keep away from solitary trees, wire fences, small huts in exposed places, tree tops and wide open spaces.
4. If you must remain outside, the best protection is a cave or a hole in the ground.

5. If an electric storm takes you unawares near solitary trees, it is generally best to remain in the open space, far from trees at a distance greater than the height of those trees.
6. Stay far from doors and open windows, stoves and electrical equipment such as radios, TVs, lamps etc.
7. Do not use steel or metal utensils such as fishing rods, guns, rifles, etc. during an electrical storm.
8. Stay away from water and small boats.
9. Do not bathe in swimming pools, showers and bathtubs. Contact with water and water pipes is dangerous.
10. If you are travelling during an electrical storm, remain in your car. Cars offer excellent protection.

THESE RECOMMENDATIONS SHOULD BE YOUR MOST IMPORTANT GUIDE IN THE EVENT OF DISASTER. STUDY THEM - KEEP THEM AND ALWAYS HAVE THEM HANDY.

APPENDIX B

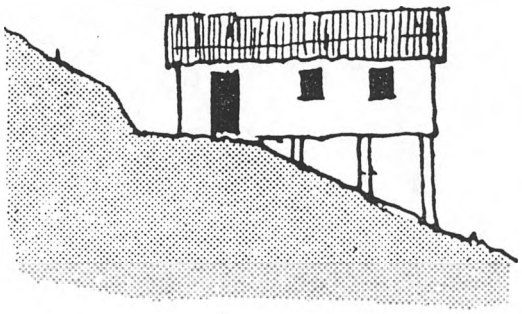
CYCLONE RESISTANT HOUSING MANUALS

DÉGA GRO VAN KA FÈ SOU KAY NOU KONN BATI YO.

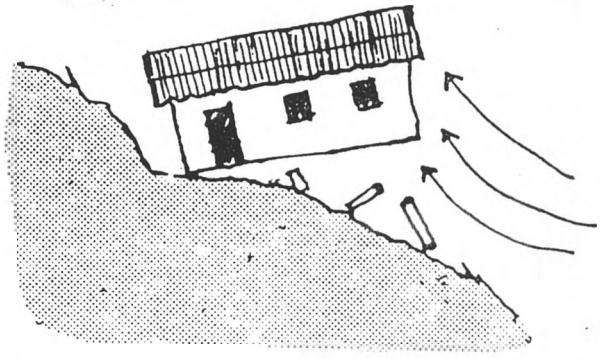
From KOUMAN MOUTE TI KAY NOU YO PI SOLID, A Manual for strengthening indigenous housing in Haiti, prepared by INTERTECT for Catholic Relief Services, Port-au-Prince, Haiti.

Lè nap bati kay sou flan mòn

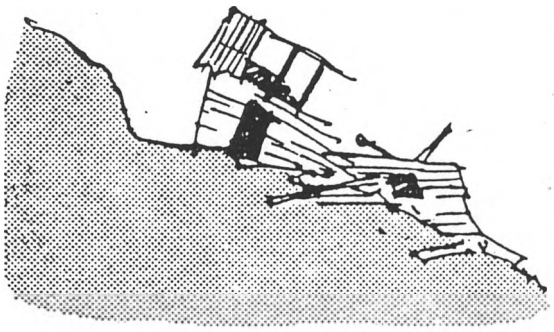
Sa pou nou pa fè:



Gin koté moun rinmin mouté kay sou poto, tankou nan pòtré-a...

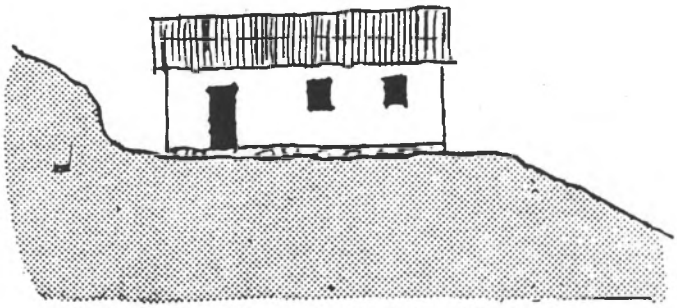


Lè van an ap souflé soti anba mouté sou flan mòn lan, li gonflé anba kay la koté poto yo yé-a....



li lévé kay la, poto yo tonbé. Epi tout kay la tonbé krasé.

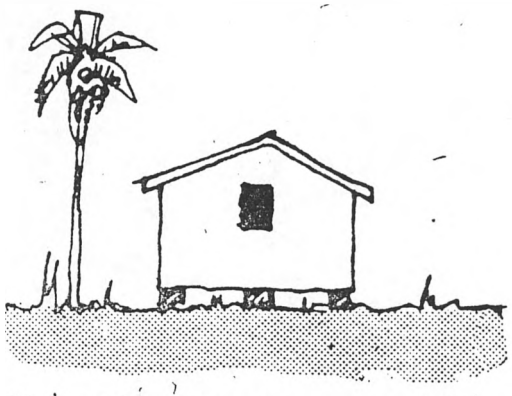
Sa pou nou fè :



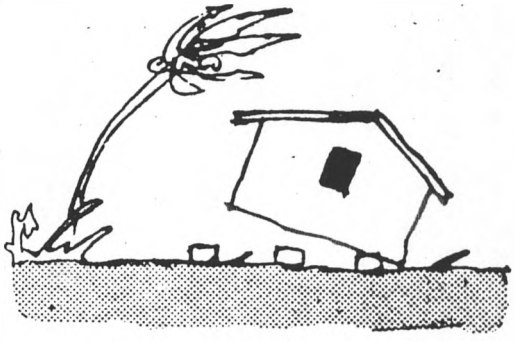
Pito nou fè you anplasman plat sou flan mòn lan. Lèfini, mété you bon fondasion pou chouké kay la.

Lè nap bati kay an planch sou blòk

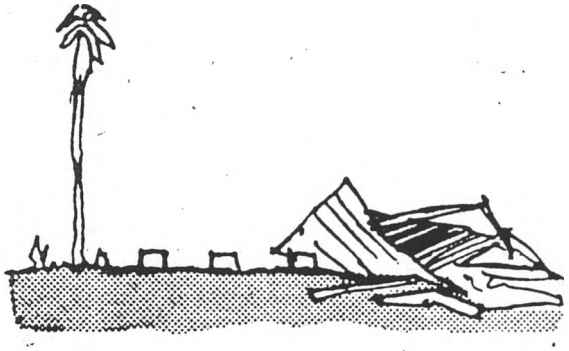
Sa pou nou pa fè:



Si kay la chita konsa sou blòk yo,
san li pa chouké nan tè-a...

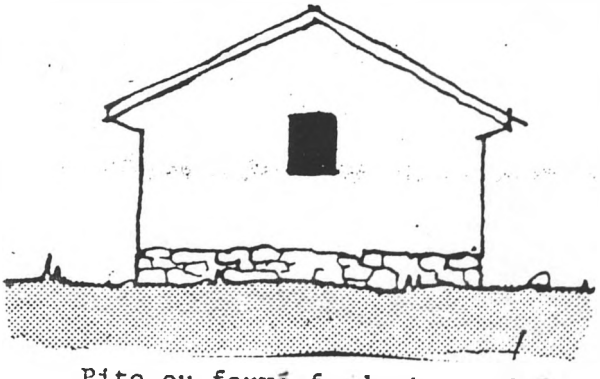


ninpòt gro van kap souflé yin
doua antré anba kay la...



épi li chaviré-l.

Sa pou nou fè :

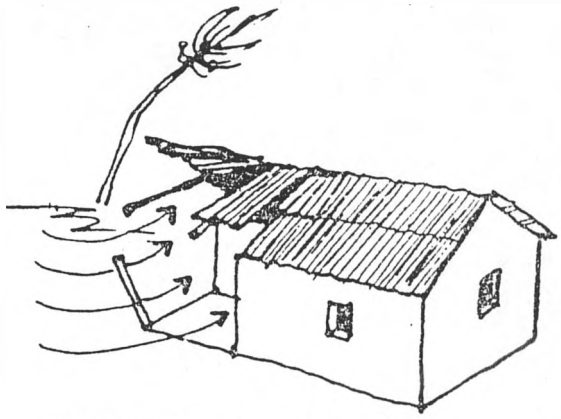


Pito ou fouyé fondasion, mété
you bon solay. Lèfini, maré
poto kay la nan solay la.

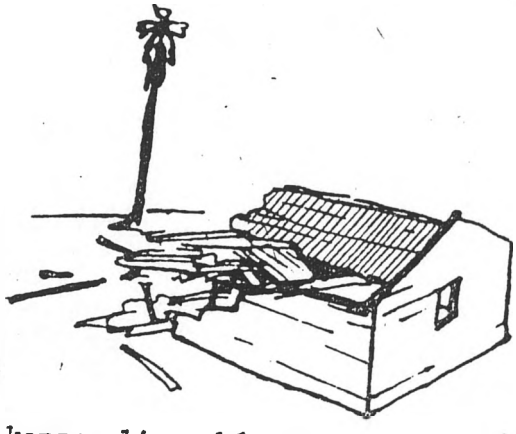
Gin moun ki rinmin mété you moso galéri sou dèvan kay yo.

Sa pou nou pa fè :

Lè nou mété you moso galéri sou dévanti you kay...

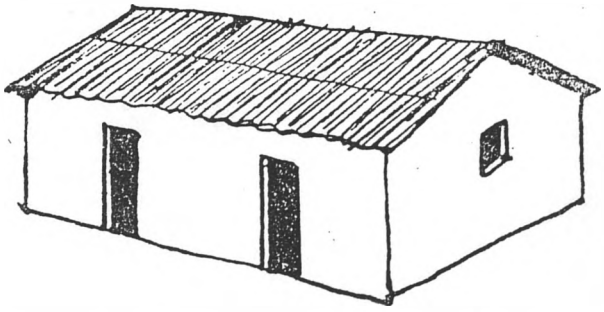


gro van ka vi-n gonflé anba touati-a bò galéri-a, épi li fè fòs, li lévé touati-a.



Lè konsa, li raché touati-a sou tèt poto yo, li pati avè-l.

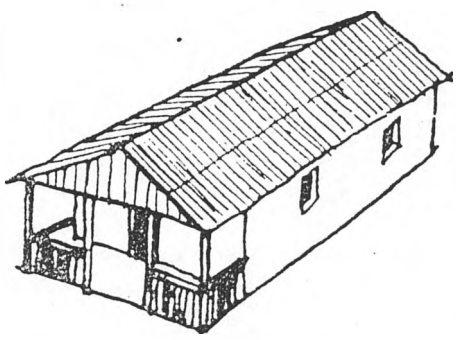
Sa pou nou fè :



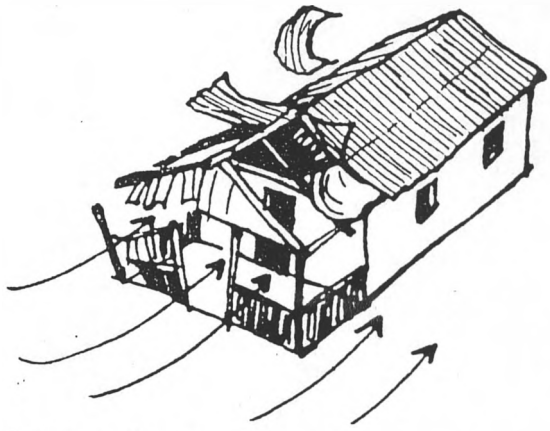
Li pi bon si nou pa mété galéri minm.

Lè nap métè galéri sou dévan you kay.

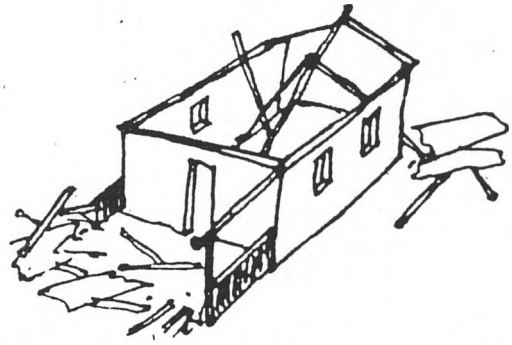
Sa pou nou pa fè :



Lè galéri-a pran tout fasad dévanti kay la...

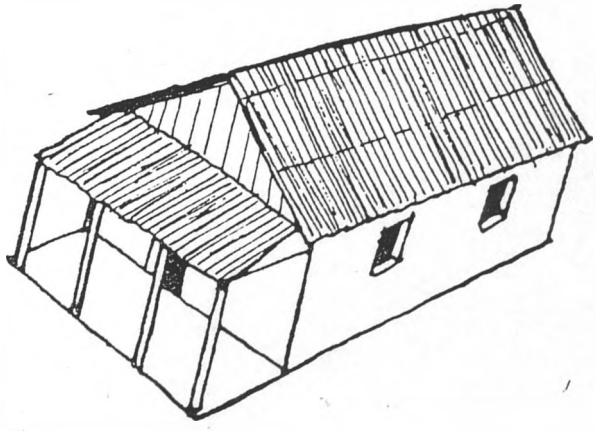


Gro van ka vi-n gonflé anba touati-a sou galeri-a, épi li fè fòs lévè touati-a.



Lè konsa, li ka raché tout touati-a nèt sou tèt poto yo, li pati avè-l.

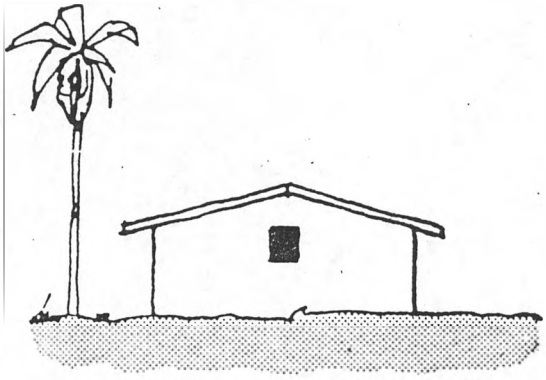
Sa pou nou fè :



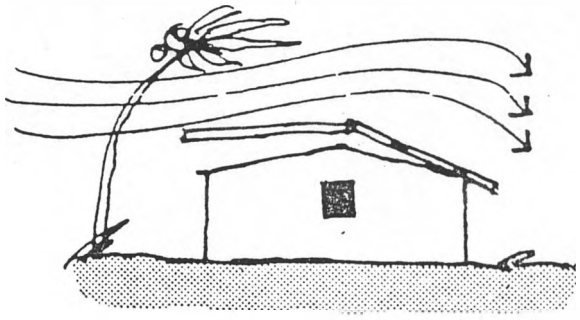
Pito nou métè you touati an chapant apa pou galéri-a. Konsa, si van an pati avèk touati galéri-a. li pat krasé rès kay la.

Lè zégoui touati-a trò kout, touati vi-n plat.

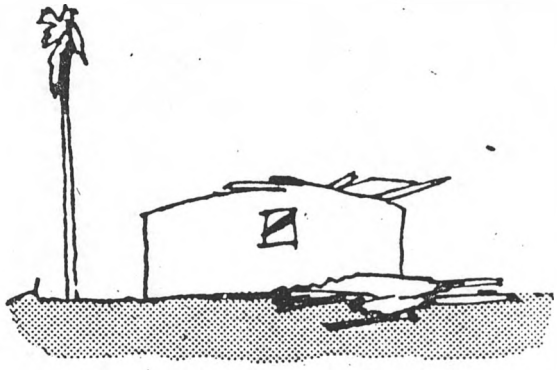
Sa pou nou pa fè :



Lè konsa, fòs van an ka ralé touati-a mouté lè lap pasé avèk fòs sou anro kay la.



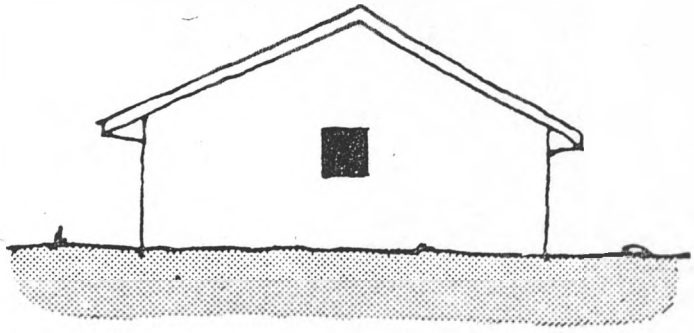
Li ka rivé raché touati-a sou tèt poto yo...



épi li pati avèl.

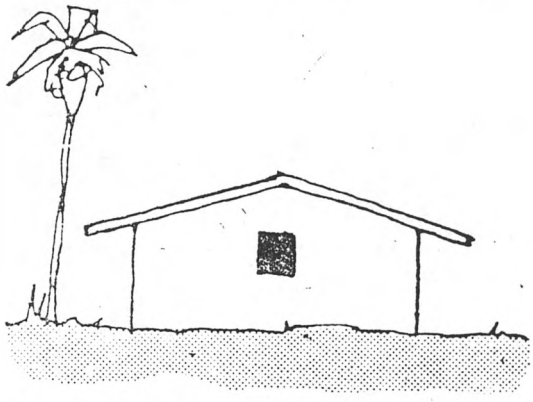
Sa pou nou fè :

Kalkilé rotè zégoui-a pou li bay touati-a you pant nòmal. (Ouè ésplikasion nou bay nan paj 20 ak 21.)

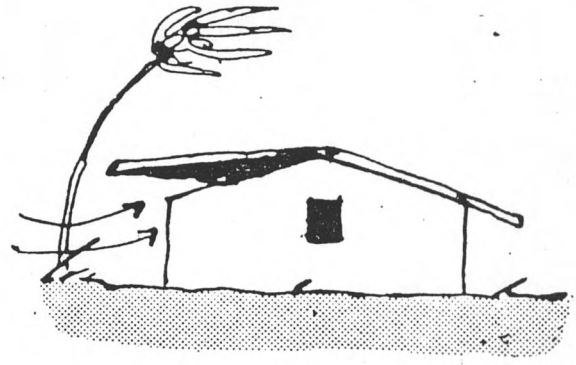


Zèl lamié yo.

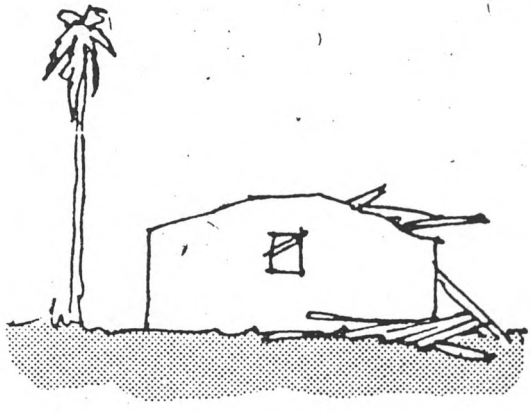
Sa pou nou pa fè :



Pa kité zèl lamié yo vi-n trò long.



Sa ka pinmèt fòs van an vi-n gonflé trop anba-l...

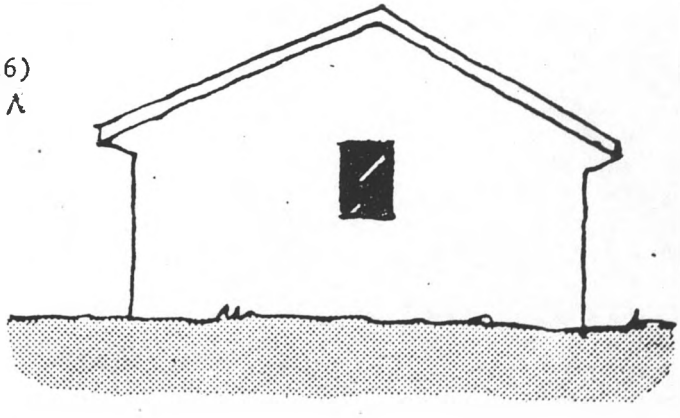


li ka raché touati-a, pati avè-l.

Sa pou nou fè :

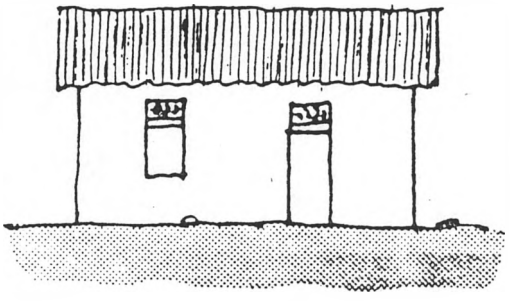
1. Pa kité zèl lamié yo dépasé sèz (16) pous osinon karannsis (46) santimèt ' longè.

2. Lèfini, mété you ti plafon anba lamié yo pou inpozé van an vi-n gonflé ant touati-a ak panno yo.

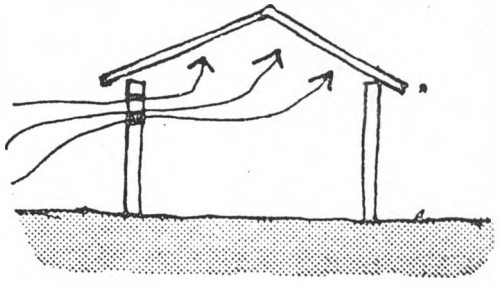


Linpòt.

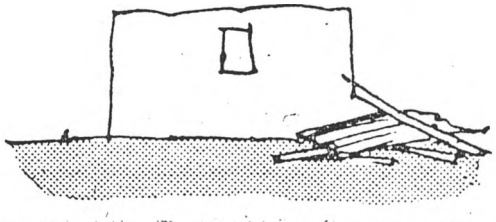
Sa pou nou pa fè :



Trou linpòt yo kité anro finnèt ak pòt yo pinmèt lè antré nan kay la.



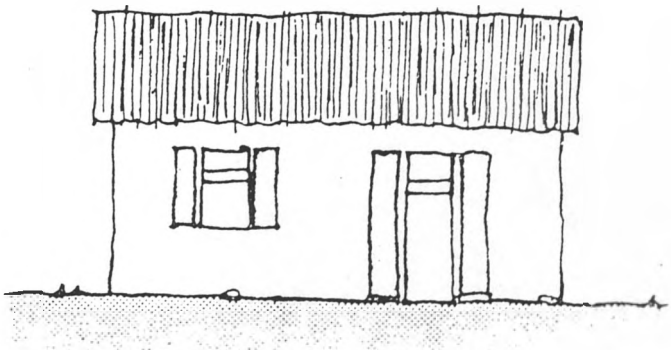
Lè gro van ap souflé, lap antré anndan kay la, vi-n gonflé anba touati-a, pousé-l moutè.



Si van an fò anpil, li ka dékouvri kay la.

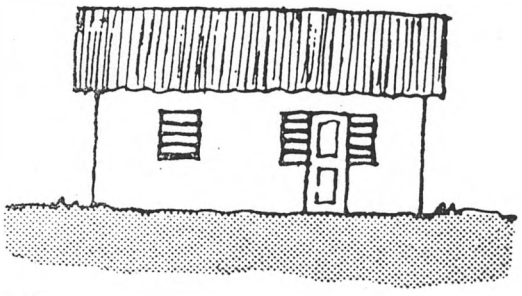
Sa pou nou fè :

Toujou métè ti finnèt an boua dévan linpòt yo pou nou ka fèmin yo lè gro van ap souflé.

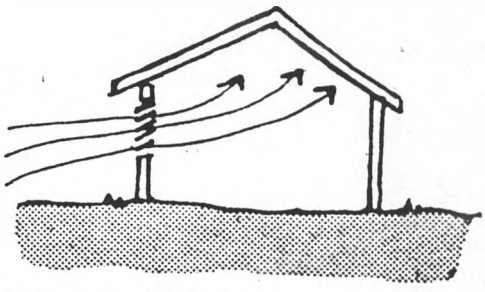


Pèsièn.

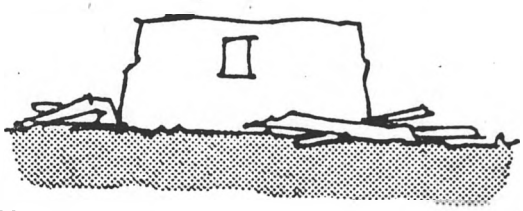
Sa pou nou pa fè :



Pèsièn yo kité lè antré anndan kay la, pou kinbé-l frè

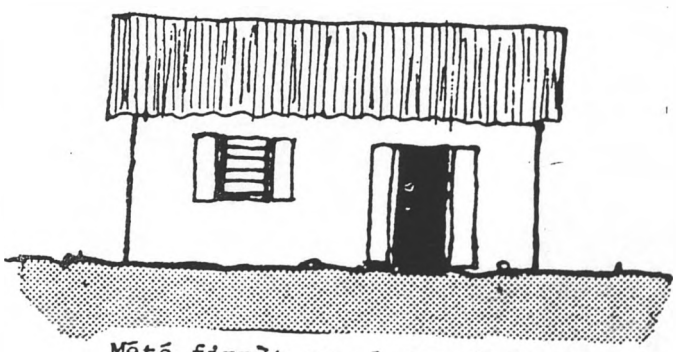


Min yap kité gro van an antrè anndan kay la, vi-n gonflé anba touati-a, pousé-l couté.



Si van an fò anpil, li ka dékouvri kay la.

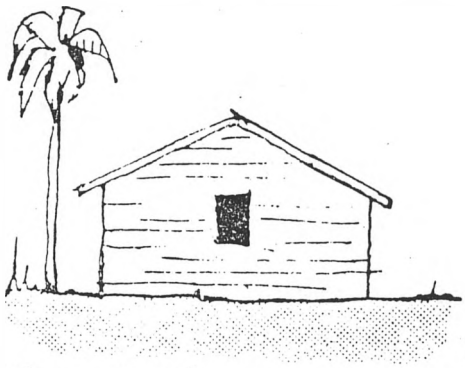
Sa pou nou fè :-



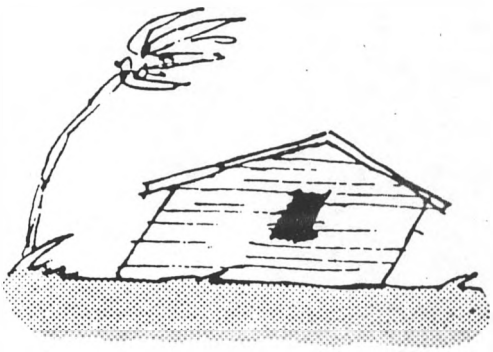
Mété finnèt an planch dèyè pèsièn yo pou nou ka fèmin yo lè gro van an ap souflé.

Lè nap bati kay an planch.

Sa pou nou pa fè :



Lè nap bati you kay an planch, si panno yo pa ranfòsé, si poto yo pa byin choukè...

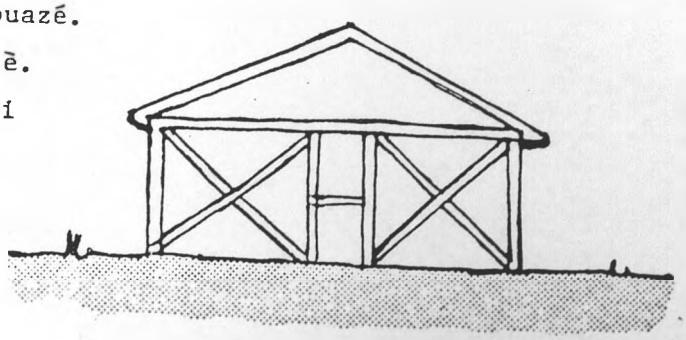


lè gro van an ap souflé, kay la ka pa gin kont fòs pou li kinbé, li ka kouché you bò...

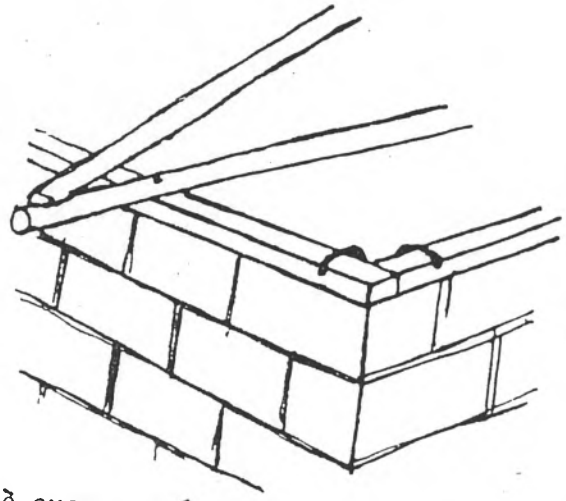
jouk li krasé.

Sa pou nou fè :

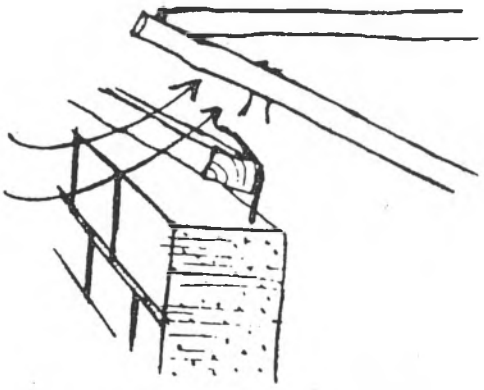
1. Ranfòsé panno yo ak poto gèt kouazé.
2. Planté poto yo byin solid nan tè.
3. Protéjé poto yo pou yo pa pouri anba tè-a. Badijonnin yo ak gro grès anvan ou mété yo nan tè.



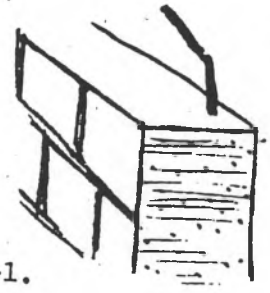
Chapant touati-a ka pa maré solid ak rès kay la.



Lè ouap mouté touati sou kay ak panno blòk, si ou maré travès la konsa sou blòk yo...

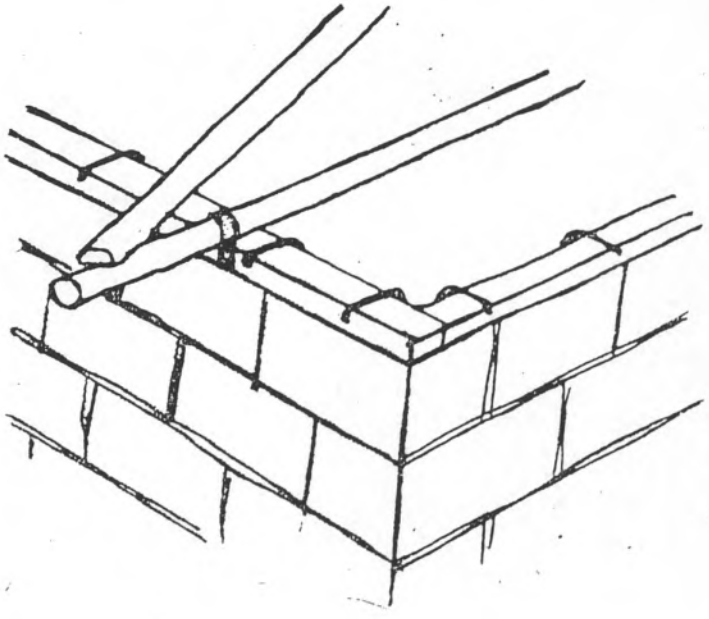


li pap ka kinbé trop anba rafal gro van kap pran li pa anba...



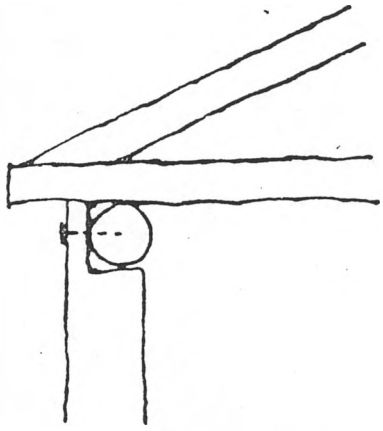
jouk li raché-l, li pati avè-l.

Sa pou nou fè lè konsa :

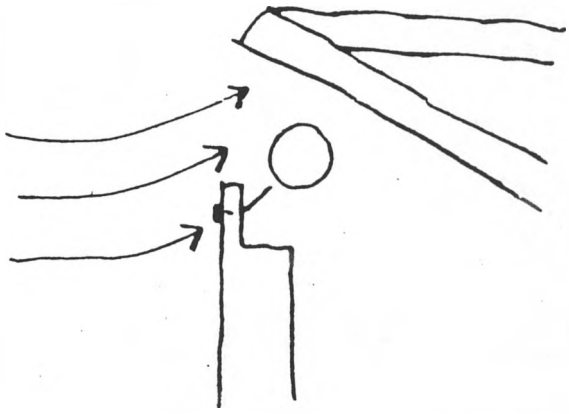


1. Mété anpil ti bout fè byin long kanpé sou tèt panno yo. Sé yo ki pral kinbé travès yo.
2. Lèfini, maré sabliyé yo sou travès yo ak moso fè plat pou ba yo plis fòs pou yo kinbé.

Lè ouap mouté touati sou tèt poto boua :



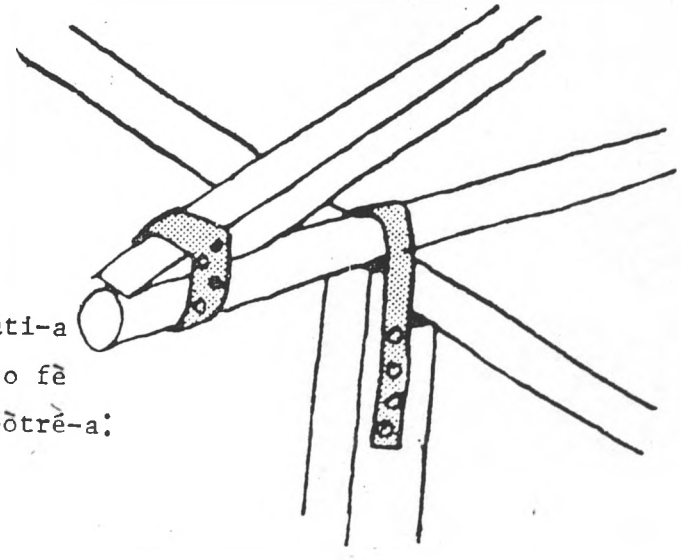
Si nou klouré travès yo sou tèt poto panno yo ak you grinn klou, li té mèt gro klou...



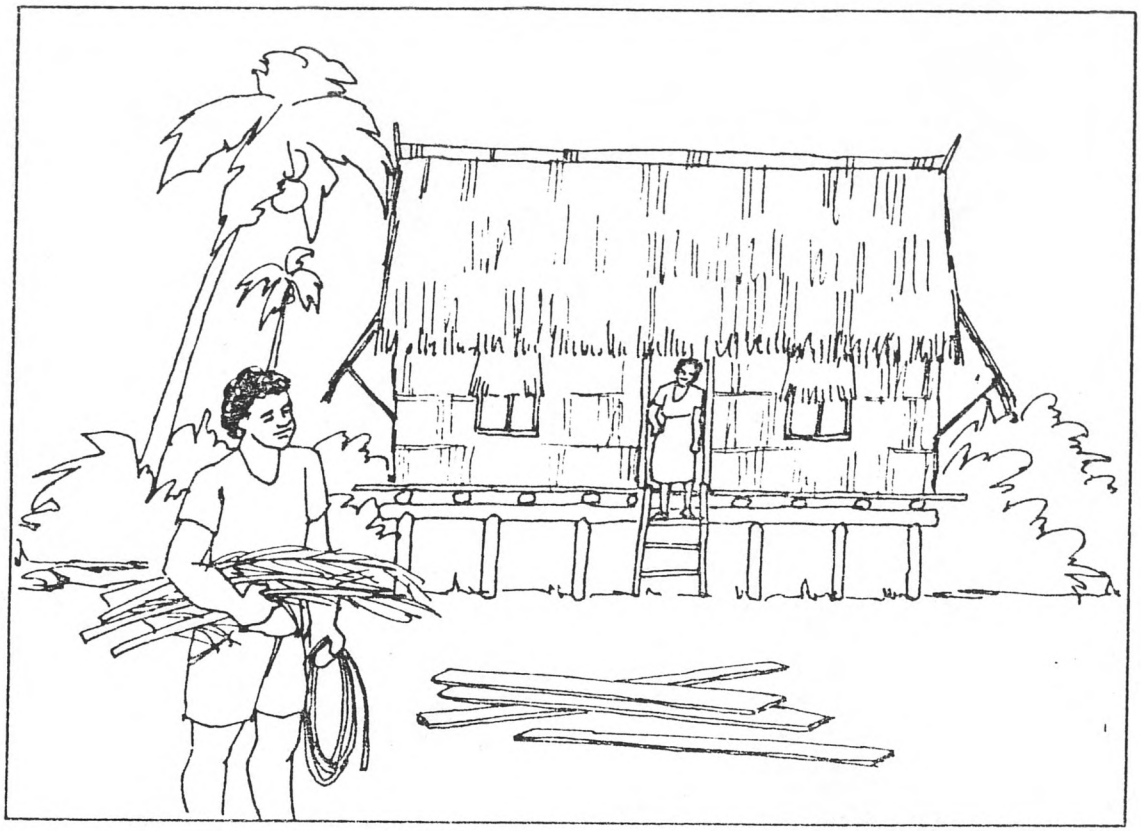
lè fòs van an vi-n gonflé anba rébò touati-a, li ka raché-l soti nan klou-a...

épi touati-a volé, li pati.

Sa pou nou fè lè konsa :

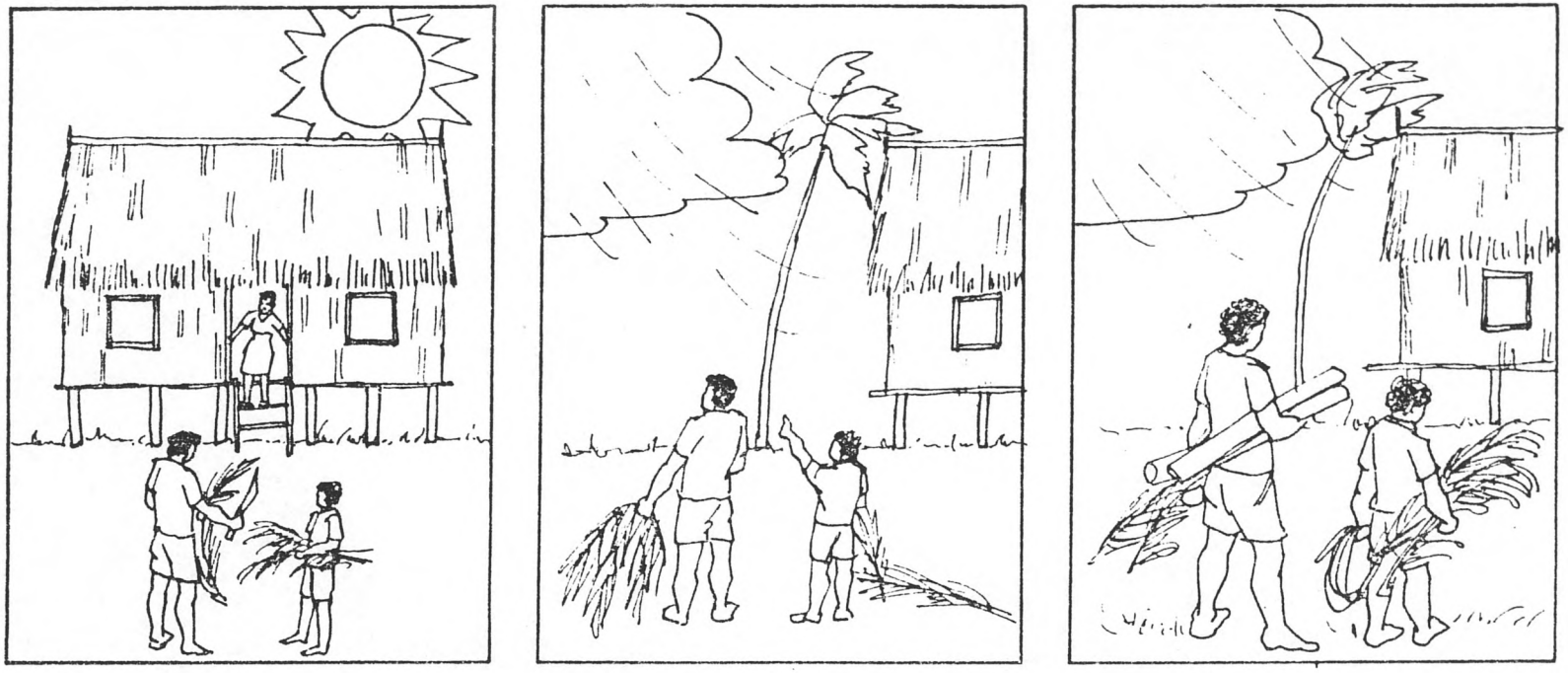


Lè nou fi-n klouré chapant touati-a sou tèt poto yo, maré yo ak moso fè plat jan nou ouè yo fè sa nan pòtrè-a:

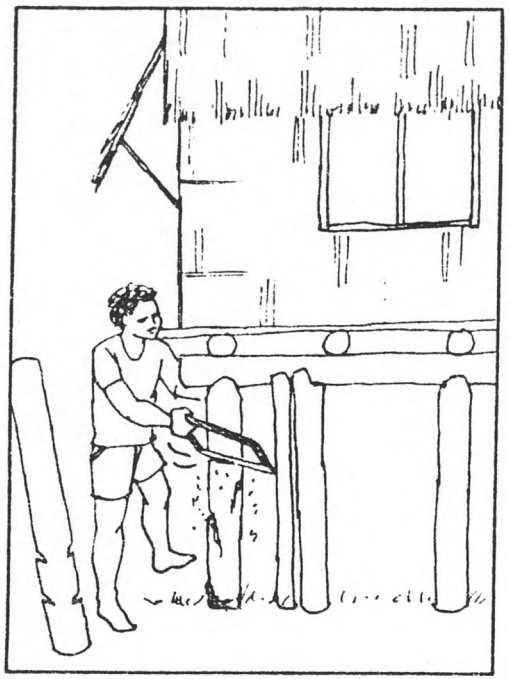


HOW TO STRENGTHEN A SOLOMON ISLANDS HOUSE

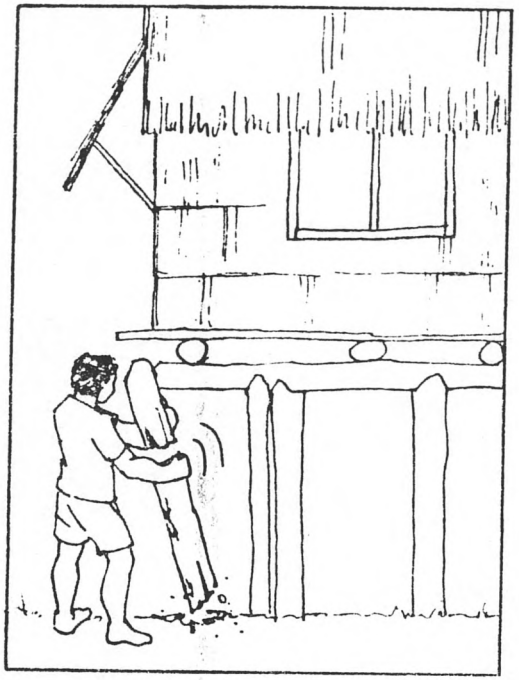
Manual prepared by INTERTECT under contract
to the East-West Center Pacific Islands Development
Program (PIDP) with funding provided by the
Office of U.S. Foreign Disaster Assistance, AID.



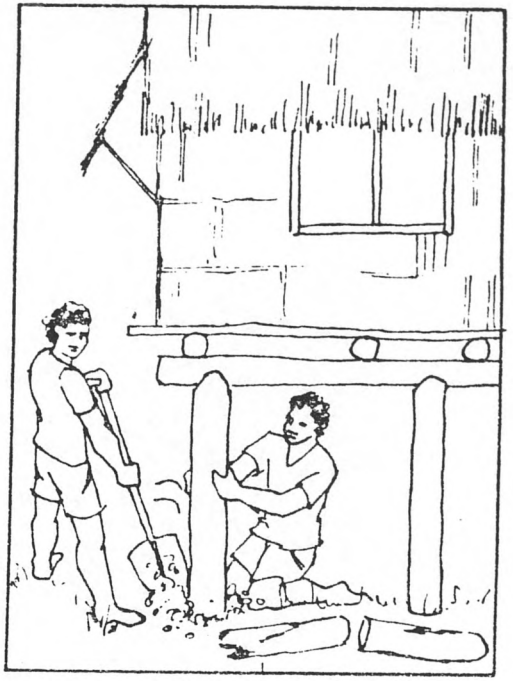
IF A CYCLONE APPROACHES YOU CAN USE LOCAL MATERIALS TO STRENGTHEN YOUR HOUSE.



LOCATE ROTTEN POSTS

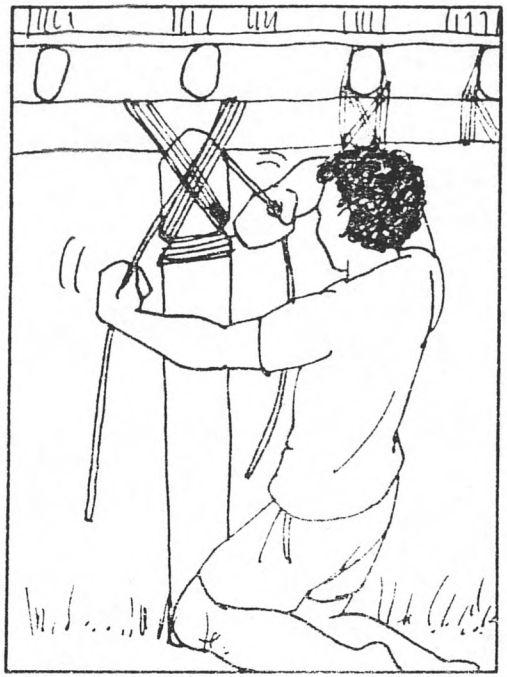


REMOVE THEM

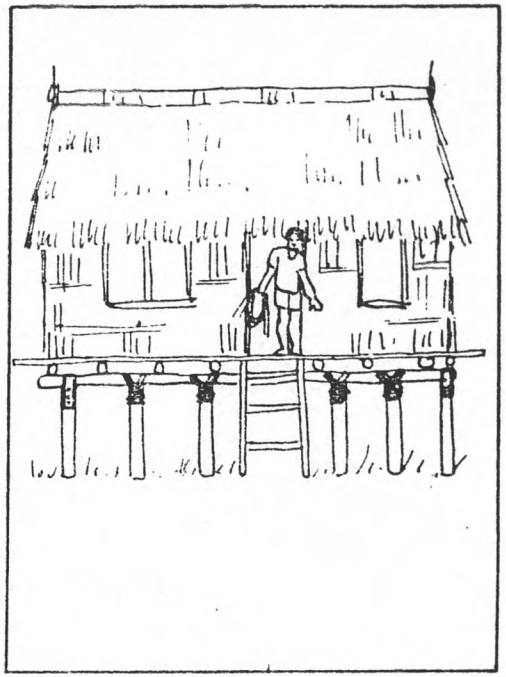


AND REPLACE THEM WITH NEW POSTS

IF METAL STRAPS ARE NOT AVAILABLE

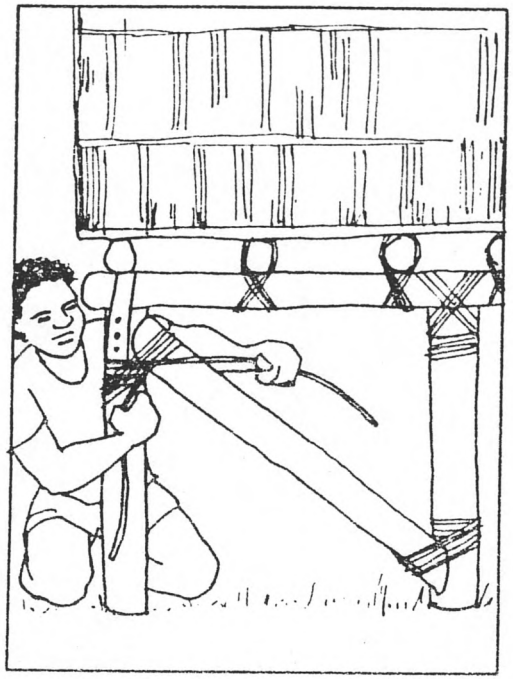


USE WIRE OR BUSH ROPE TO TIE WOOD BEAMS TO FOUNDATION POSTS

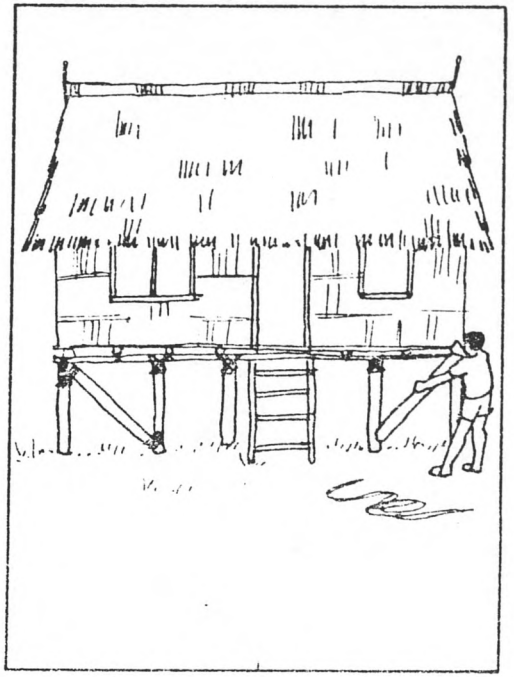


ALL BEAMS AND POSTS SHOULD BE TIED TOGETHER

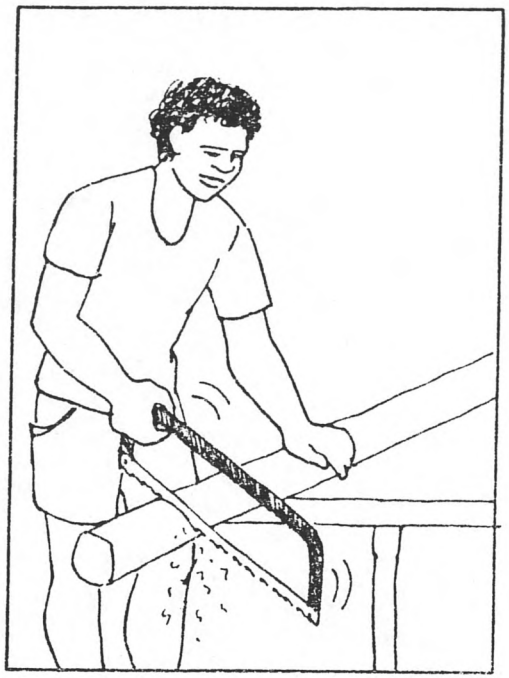
CUT WOOD TIMBERS FOR BRACES



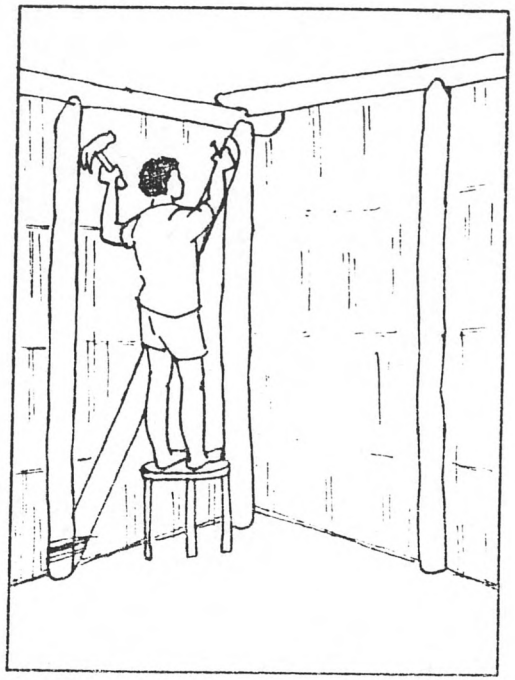
TIE THE BRACES LIKE THIS.



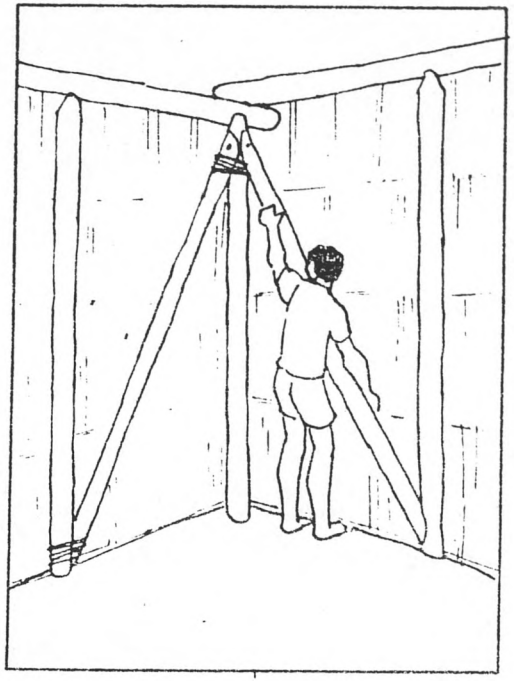
STRENGTHEN EACH CORNER WITH A WOOD BRACE



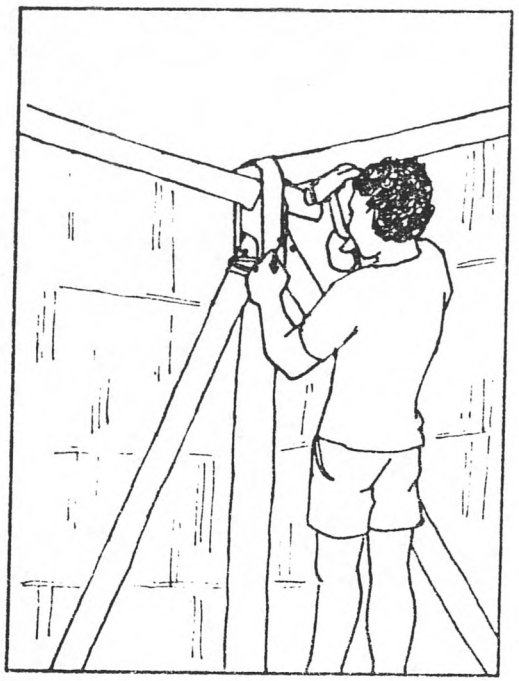
CUT WOOD TIMBERS



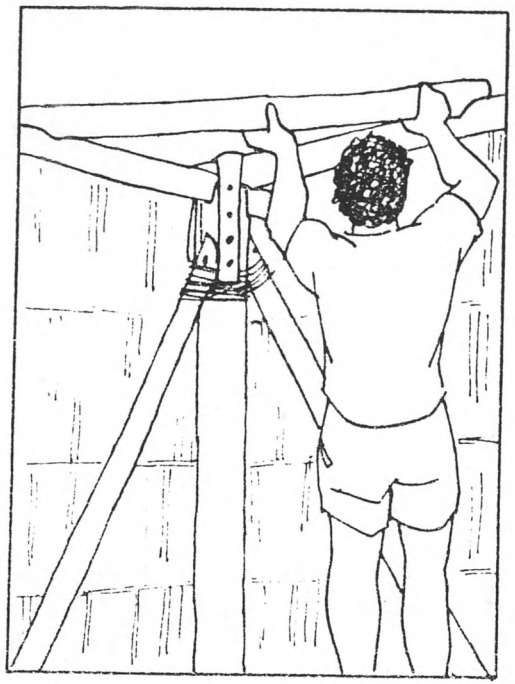
MAKE DIAGONAL BRACES



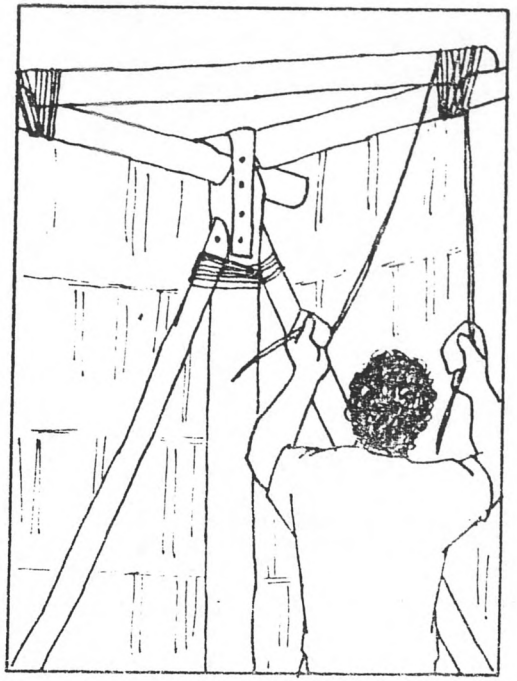
STRENGTHEN ALL CORNERS IN THE HOUSE WITH WOOD BRACES



USE METAL STRAPS TO STRENGTHEN JOINTS

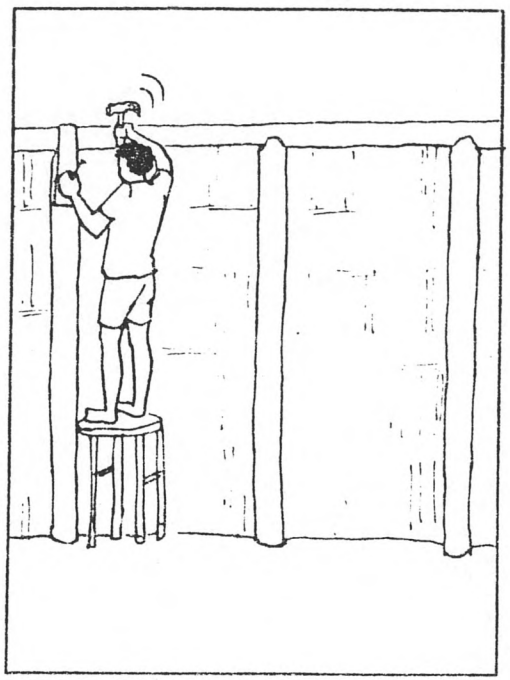


PUT A WOOD BRACE IN EACH CORNER

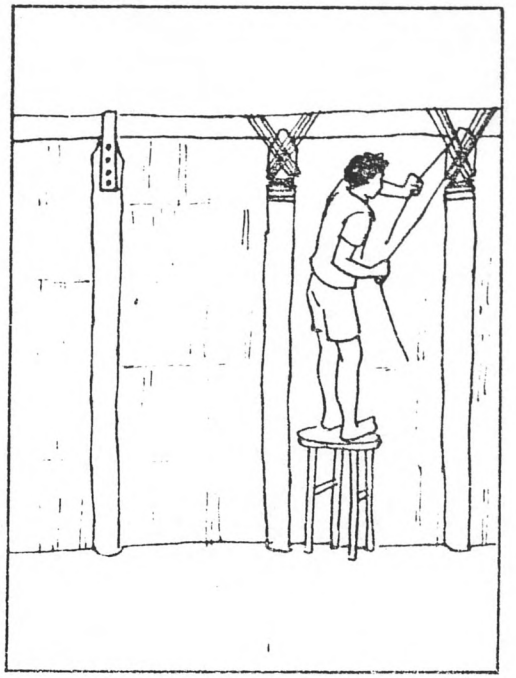


TIE EACH BRACE WITH WIRE OR BUSH ROPE

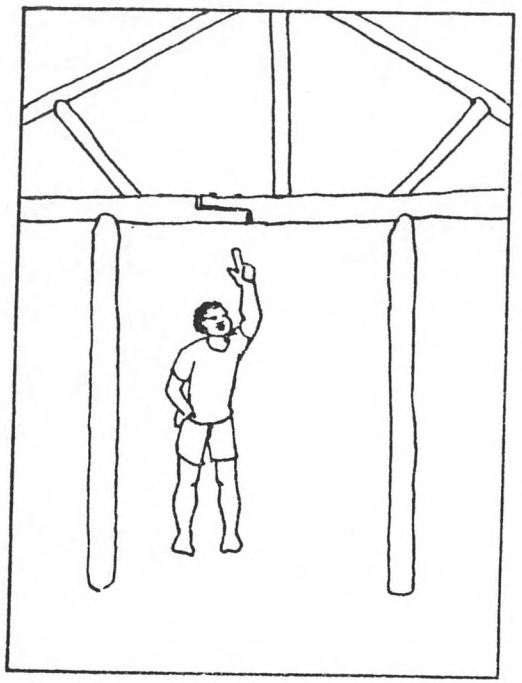
MAKE METAL STRAPS



TIE ROOF BEAM TO WALL POSTS

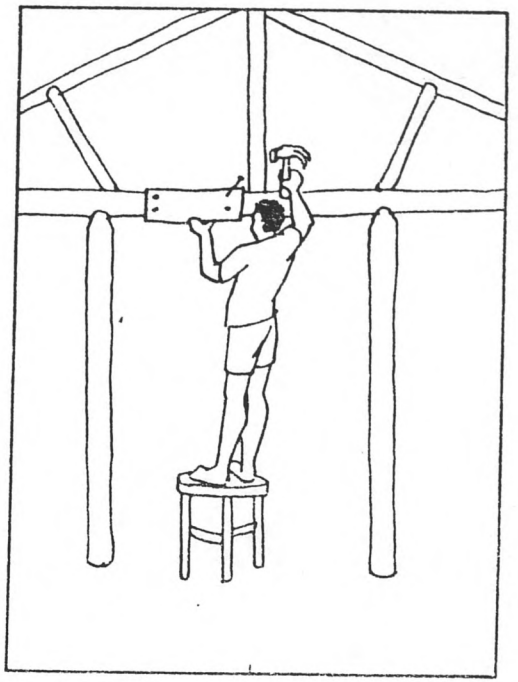


WIRE OR BUSH ROPE CAN BE USED INSTEAD OF METAL STRAPS

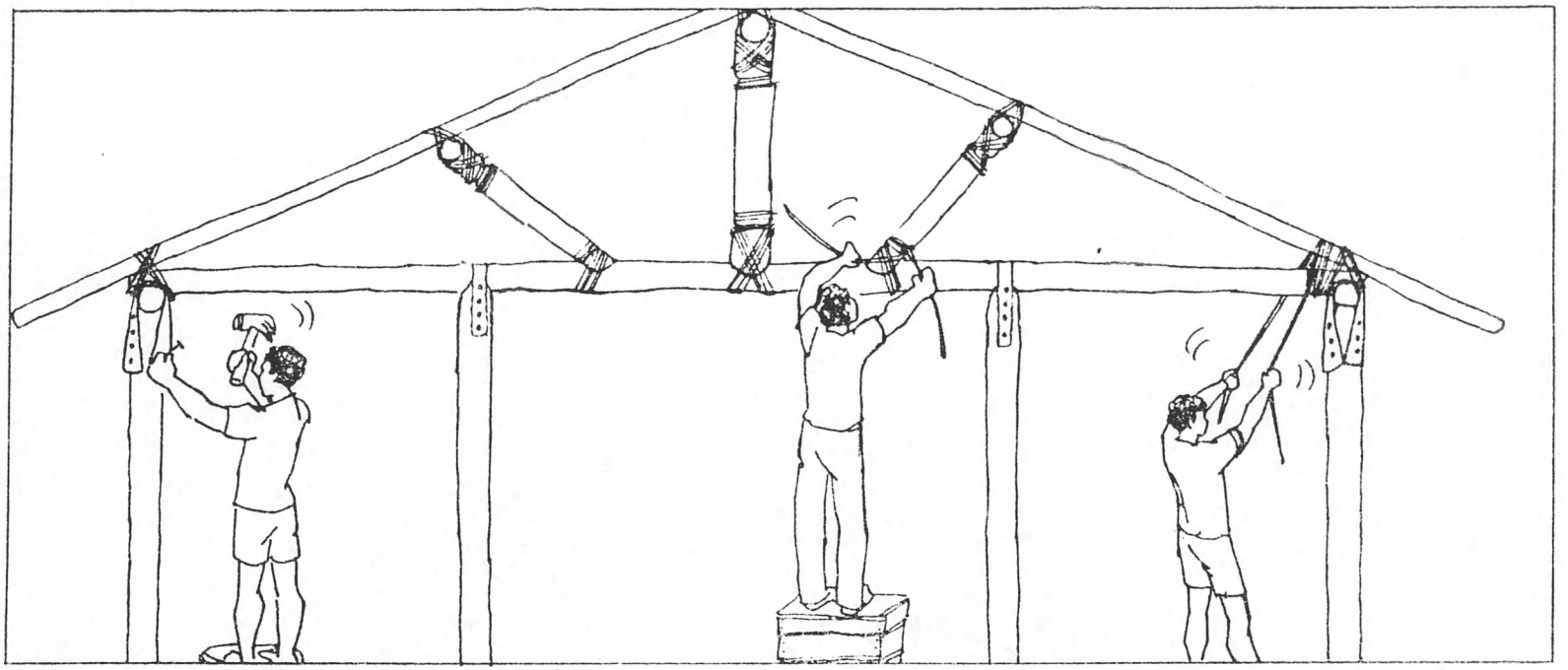


WEAK JOINTS CAN FAIL IN A CYCLONE

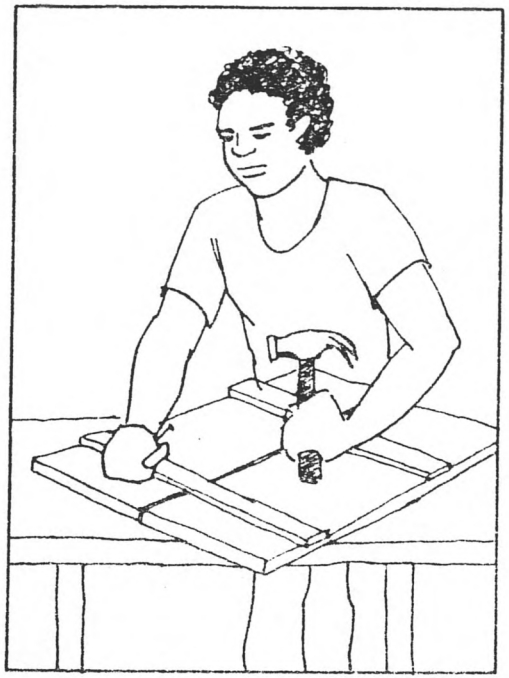
CUT WOOD BRACES

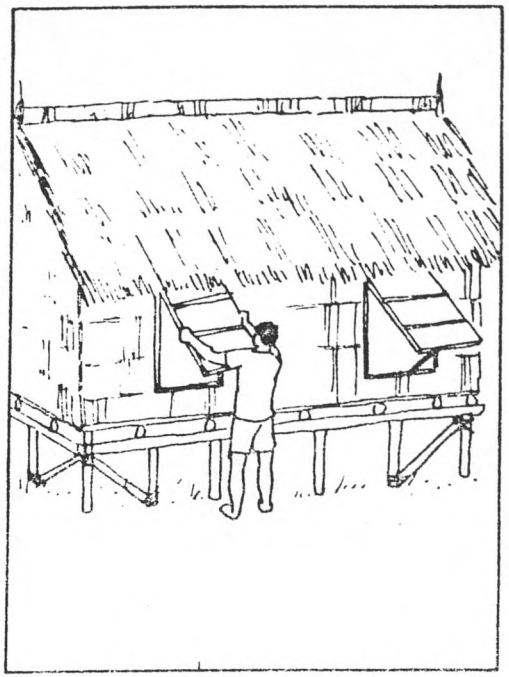


NAIL ON BOTH SIDES OF JOINTS

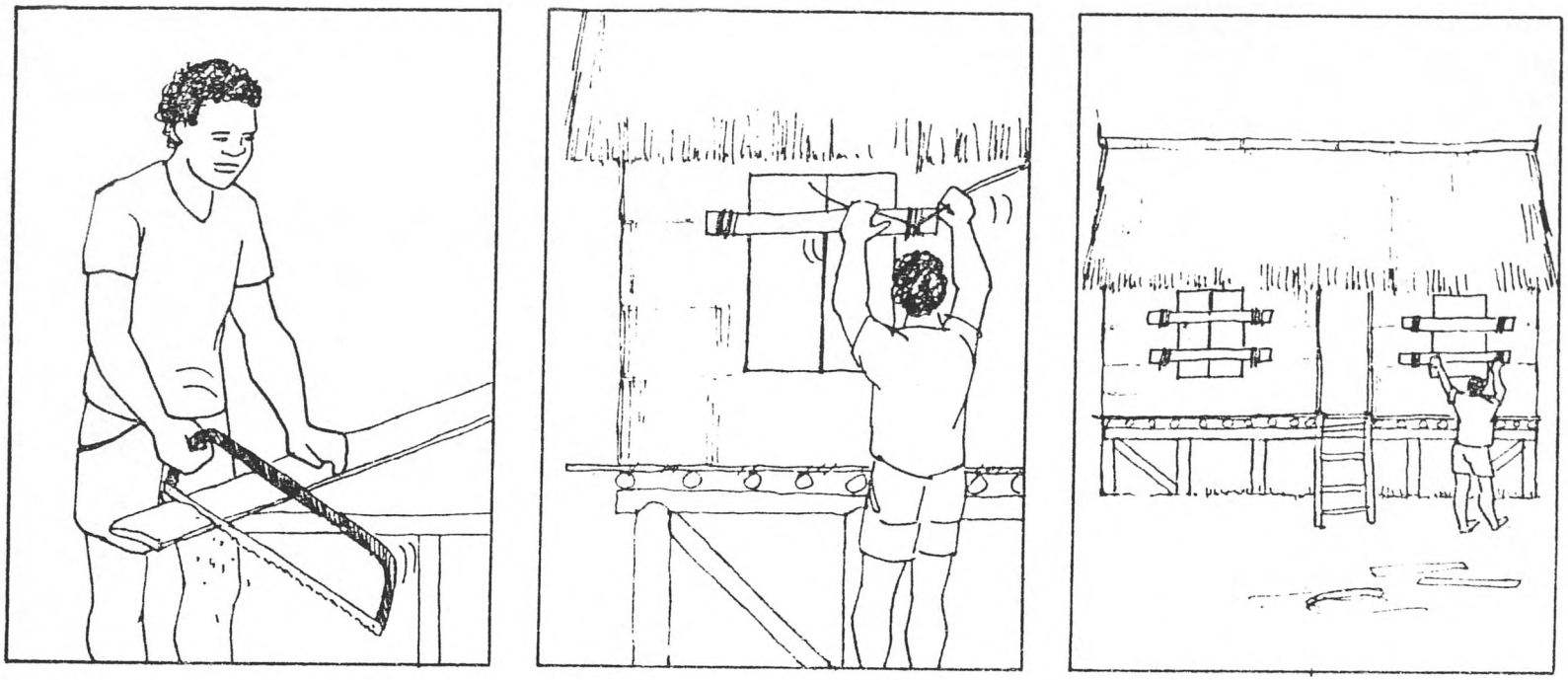


ALL JOINTS SHOULD BE TIED TOGETHER WITH WIRE, BUSH ROPE, OR METAL STRAPS

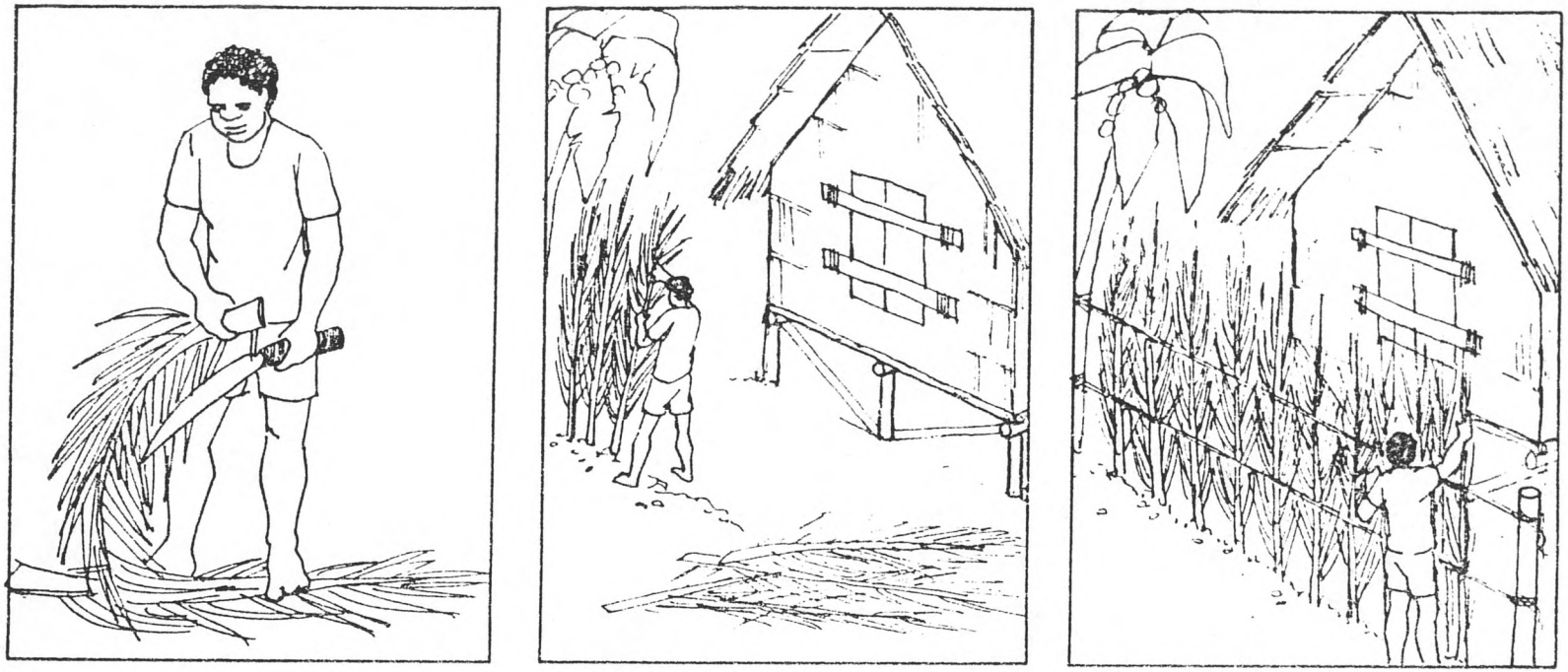




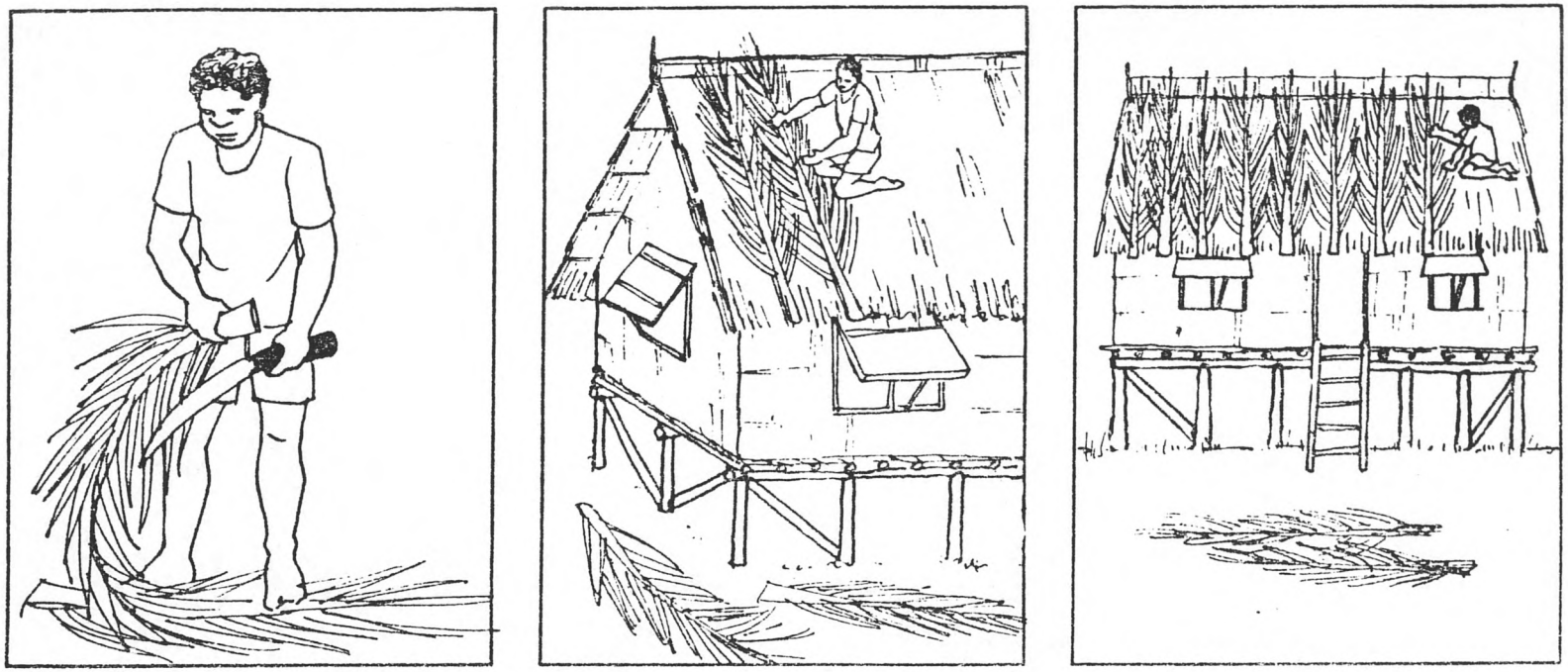
MAKE WOOD SHUTTERS TO CLOSE ALL WINDOWS DURING A CYCLONE



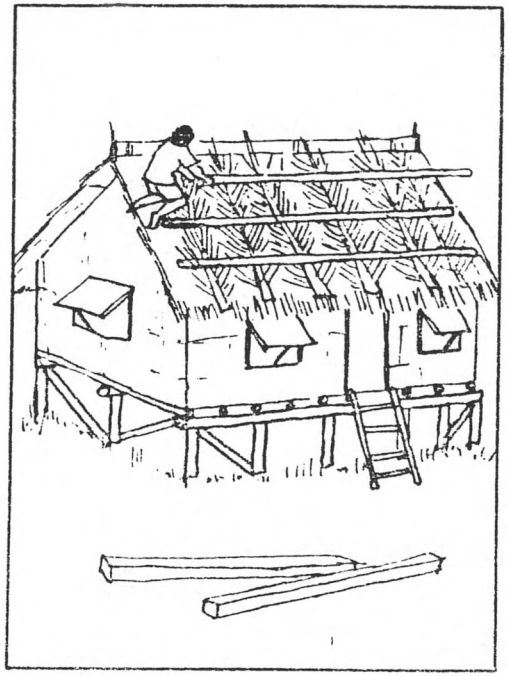
FASTEN SHUTTERS SECURELY BEFORE A CYCLONE

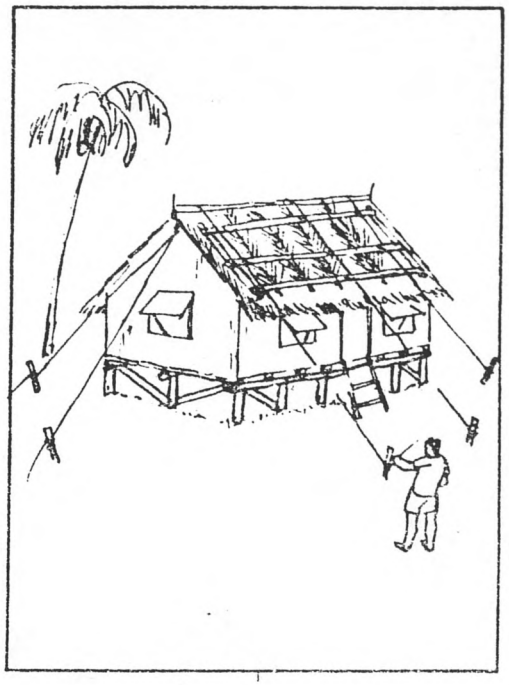


MAKE A CYCLONE FENCE OF PALM LEAVES TO BLOCK WIND AND FLYING OBJECTS DURING A CYCLONE

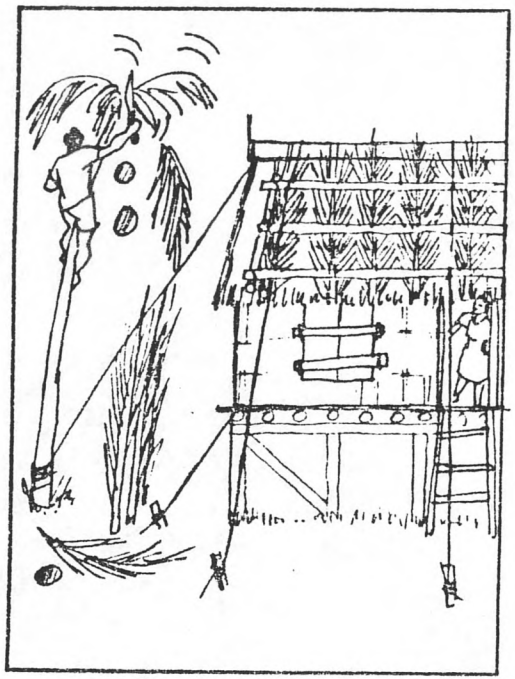


USE PALM LEAVES TO PROTECT THATCHED ROOFS DURING A CYCLONE

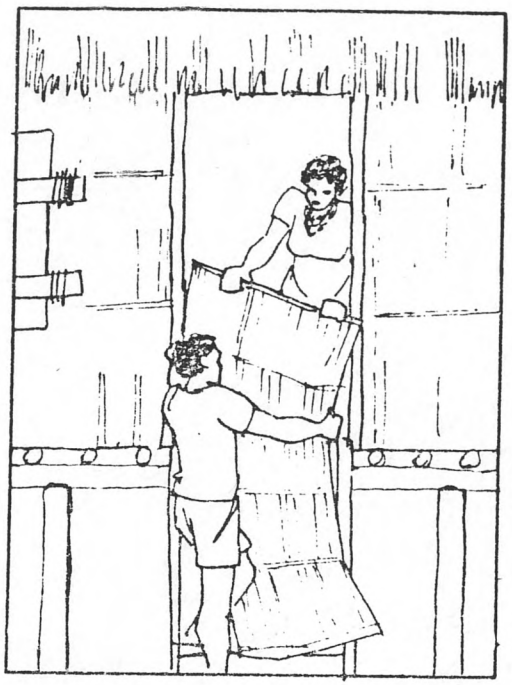


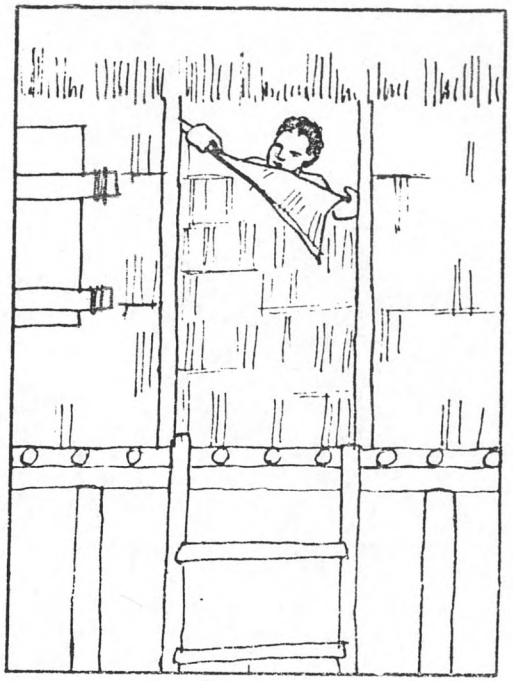


USE WOOD AND BUSH ROPE TO TIE DOWN THE ROOF

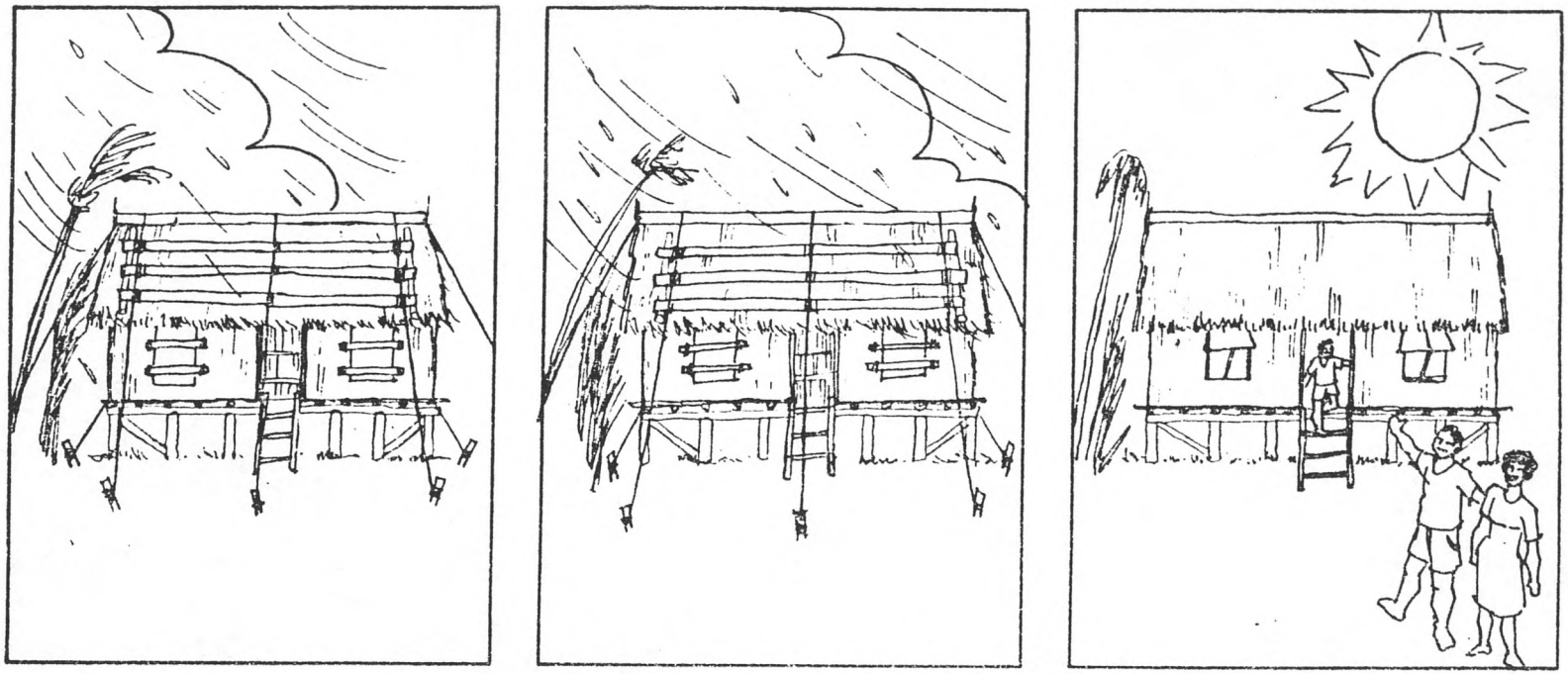


PICK UP LOOSE OBJECTS NEAR HOUSE BEFORE A CYCLONE





CLOSE DOOR WITH BUSH MATERIALS OR BOARDS



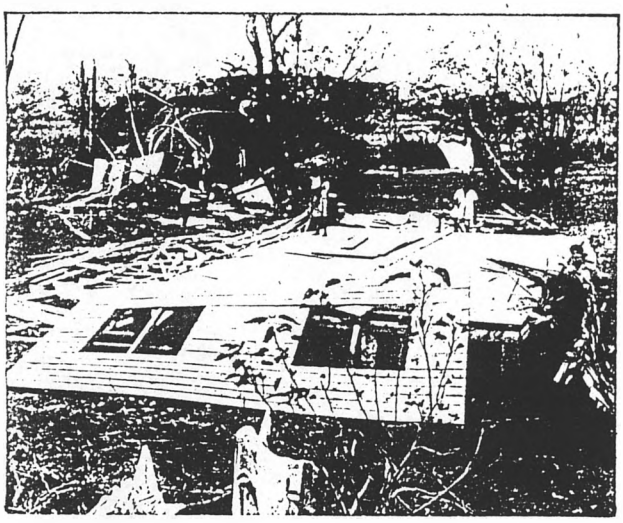
IF YOU FOLLOW THESE SUGGESTIONS, YOUR HOUSE WILL BE SAFER AND STRONGER.

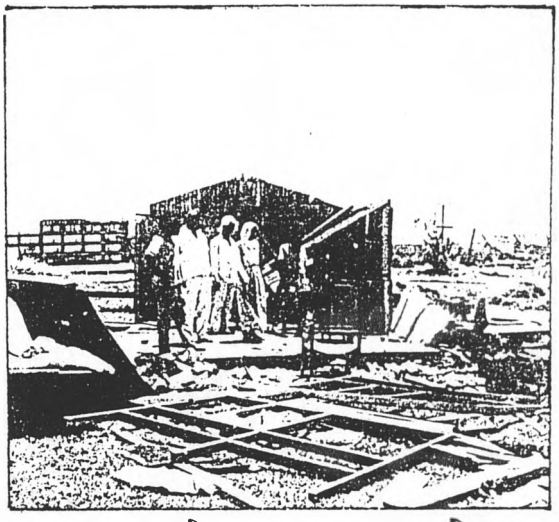
FOR MORE INFORMATION, CONTACT YOUR PROVINCIAL WORKS OFFICER.

APPENDIX C

DISASTER AWARENESS POSTERS

CYCLONES
तूफान





Cyclone Season is November through April. The following is intended to help

WARNINGS

GALE WARNING Expect Winds over 33 knots (but not over 47 knots)

danger for small boats, some damage to branches and overhead lines

STORM WARNING Expect Winds over 47 knots (but not over 63 knots)

high seas, heavy surf; damage to trees and weak structures; heavy rain and flooding.

HURRICANE WARNING Expect Winds over 63 knots

very high seas, heavy surf; high storm tides; severe damage to buildings; uprooted trees; torrential rain and flooding.

BEFORE THE CYCLONE Firmly secure your buildings. Keep nails, saw, hammer, ladder, battens, tinned food (biscuits, tinned fish, etc.) hurricane lamps, kerosene, spare batteries and candles. Store drinking water. Move your boats, animals and car to safety.

DURING THE CYCLONE Keep indoors and listen to radio progress reports. Do not attempt to go outside since flying debris can kill you. Keep away from beaches.

AFTER THE CYCLONE Seek medical attention for injuries. Report damage (water mains, sewers, electricity lines, etc) to appropriate authorities. If necessary boil water before drinking. Keep clear of electrical lines.

Prepared by the Emergency Services Committee, Ministry of Home Affairs.

तूफान का मौसम नवम्बर से अप्रैल भर रहता है।
निम्न लिखित आप की सहायता के लिये है।

चेतावनियाँ

गैइल वोर्निंग : ३३ नोट्स से ऊपर हवा चलने की अपेक्षा कीजिए (परन्तु ४७ नोट्स से ऊपर नहीं)—
छोटी नावों को खतरा; डालों तथा ऊपर लगे तारों को कुछ क्षति।

आंधी की चेतावनी : ४७ नोट्स से ऊपर हवा चलने की अपेक्षा कीजिए (परन्तु ६३ नोट्स से ऊपर नहीं) समुद्र में उच्च लहरें, बड़ी बड़ी तरंगें, पेड़ों तथा कमज़ोर तौर पर निर्मित चीज़ों को क्षति; गम्भीर वर्षा तथा बाढ़।

तूफान की चेतावनी : ६३ नोट्स से ऊपर हवा चलने की अपेक्षा कीजिए। बहुत ऊंची लहरें, बहुत बड़ी तरंगें, उच्च तूफानी ज्वार; इमारतों को गम्भीर क्षति, पेड़ उखड़ सकते हैं; मूसलधार वर्षा तथा बाढ़।

तूफान से पहले : अपनी इमारतों की ठोस सुरक्षा प्रबन्ध कीजिए। नीले, आरी, सीढ़ी, पटरियां, टीन वाले भोजन (बिस्किट, मछली आदि) तूफान के समय काम में आने वाली बत्तियां, केरोसीन, अतिरिक्त बैटरियां तथा मोम बत्ती रखिए। पीने वाला पानी संचित रखिए। अपनी नावों, पशुओं तथा गाड़ी को सुरक्षित जगह कर दीजिए।

तूफान के दौरान : सारी तैयारियां पूरी हो जानी चाहिए। भीतर रहिए और रेडियो पर प्रगति रिपोर्ट सुनते रहिए। चूंकि उड़ते हुवे अवशेष आपकी प्राण ले सकते हैं अतः बाहर निकलने का प्रयास मत करें। समुद्री तटों से दूर रहिए।

तूफान के बाद : जख्मों का इलाज कराइए। (पानी के मुख्य नले, स्यूज, बिजली के तार आदि) को हुई क्षति की सूचना संबंधित अधिकारियों को दीजिए। आवश्यक होने पर पीने से पहले पानी को उबाल लीजिए, बिजली के तारों से दूर रहिए।

इमिर्जेन्सी सर्विसस कमेटी मिनिस्टरी ओफ होम अफेयर्स द्वारा प्रकाशित

DISASTERS DO HAPPEN,

ARE YOU PREPARED?

ICWI

Sponsored by the Insurance Company of the West Indies (ICWI)
for the office of Disaster Preparedness and Emergency Relief Co-ordination

Printed by JAMAL Press

山や崖のそばでは

海のそばでは

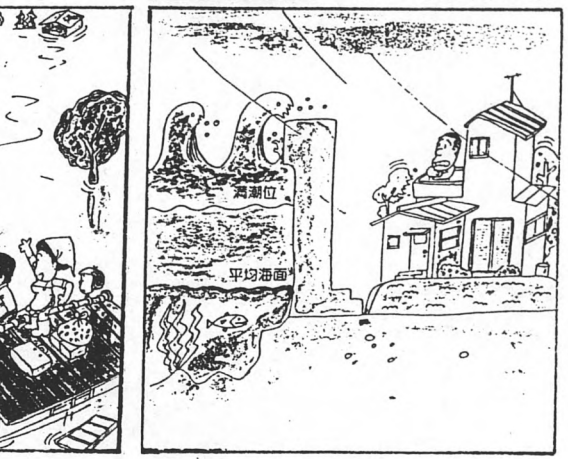
- 台風がくると、雨雲がふくれ上がり、大波が打ちよせ海を越えて陸地に押し寄せて大被害となります。台風が近くの西側を通過するときは、雨と風が強くなりますので、特に注意しましょう。
- テレビ、ラジオ、気象放送で警報などの情報に注意しましょう。
- 風が強く、雨が降りできさき早目にどこの高い場所に避難しましょう。
- 家に要塞をコンクリートなどの強いもので作り、近くに高い場所がない地域では、2階建などの避難室をできるようにしましょう。

川のそばでは

- 大雨が降ると川の水かさが増えて堤防や橋に流れ込むことがあります。また大雨では上流で大雨が降ると、下流地では雨がなくても、川の水かさが増え続けることがあるので、テレビ、ラジオ、気象放送の情報（特に雨雲）、警報などの情報に注意しましょう。
- 川の水が、堤防や橋に流れ込んできて水かさがどんどん増えるときは、特に危険です。急いで避難しましょう。
- 家に要塞をコンクリートなどの強いものにするとともに、平地部では2階建などの避難室をできるようにしましょう。

低いところでは

- 海水が急いで、雨が降るとすぐ冠水しやすいです。テレビ、ラジオ、気象放送や警報などの大雨の情報に注意しましょう。
- 台風の接近、さらさき急に増えないので、おりないで近くに高い場所へ避難しましょう。
- 家の周辺にブロック塀（2階建）などの避難室を造ってあくようにしましょう。



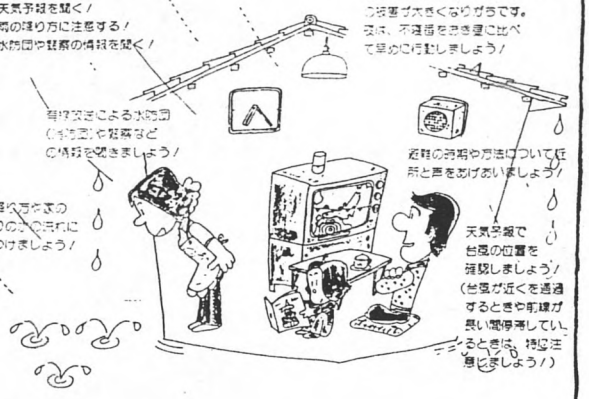
ゼロメートル地帯では

- 台風がくると、雨雲がふくれ上がり、大波が打ちよせ海を越えて大水が流れてくることがあります。低地でへ－が高いこと、地盤地下で建物が建っていることがあるで大変危険です。
- いったん堤防が切れると、海水が侵入し長期間まで水となるため、広い範囲に大きな被害が発生します。
- 浸水は、地震でも起きることがあります。このときは地盤沈下することもあるので、大変危険です。
- 市・区役所などに問い合わせて、自分の家の地盤を満潮位以上の高さに避難室をできるようにしましょう。

台風や大雨のときには

1 正しい情報を早く知る

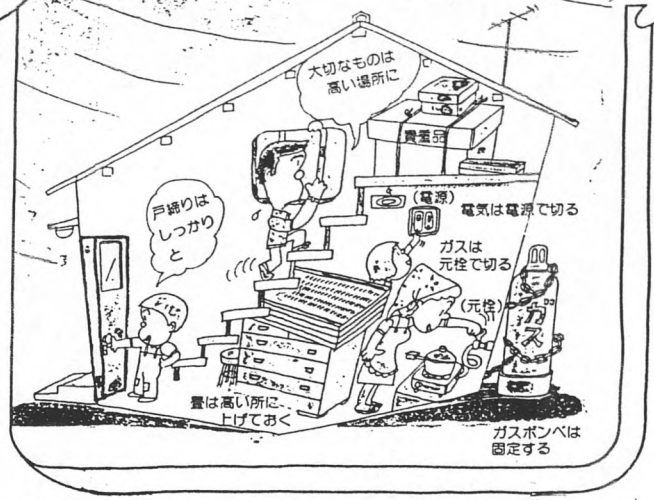
- 天気予報を聞く！
- 雨の降り方に注意する！
- 水防団や警察の情報を聞く！



2 避難を決断するには

雨は、雨量が増えるほど、人命への被害が大きくなりがちです。
夜は、不慣れなため昼に比べて早めに行動しましょう！

3 避難する前に！



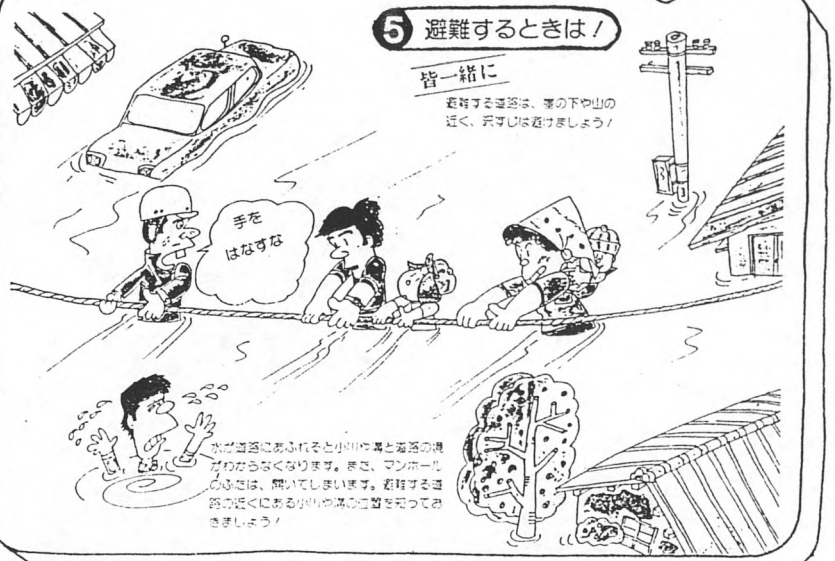
4 避難するときには次のものを持つ！

必要なものは、リュックサックなどに入れて、いつも使えるようにしましょう！

5 避難するときは！

皆一緒に

避難する道路は、雪の下や山の近く、川すじは避けましょう！



6 避難する場所は！

近くの少しでも高いところに

豆知識

- 災害時に、市町村や警察から避難の指示があったら、それに従いましょう。
- 雨量が100㎜以上になると崖崩れ、山崩れが発生しやすくなります。
- 雨が降り止んでも崖崩れや山崩れが発生することがあります。意外な場所のわき水に注意しましょう。
- 水田の跡の土地に家を建てた場合、浸水の恐れがあります。あなたの家のまわりの排水路がどこにつながっているかを確認しましょう。
- 水防活動は、法律によって行なわれていますので、一般の人もこれに協力しましょう。
- 水害による死者・行方不明の数は、最近の10年間の平均で、1年約210人です。
- あなたの住んでいる土地はどんな場所であったか、古くからそこに住んでいる人に聞きましょう。

〒305 茨城県つくば市天王台3
科学技術庁国立防災科学技術センター
電話 0298-51-1611(代表)

APPENDIX D

SAFFIR SIMPSON SCALE

The Saffir/Simpson Hurricane Scale

Scale No. 1: Winds of 74 to 95 miles per hour. Damage primarily to shrubbery, trees, foliage, and unanchored mobile homes. No real damage to other structures. Some damage to poorly constructed signs. And/or: storm surge 4 to 5 feet above normal. Low-lying coastal roads inundated, minor pier damage, some small craft in exposed anchorage torn from moorings.

Scale No. 2: Winds of 96 to 110 miles per hour. Considerable damage to shrubbery and tree foliage; some trees blown down. Major damage to exposed mobile homes. Extensive damage to poorly constructed signs. Some damage to roofing materials of buildings;-some window and door damage. No major damage to buildings. And/or: storm surge 6 to 8 feet above normal. Coastal roads and low-lying escape routes inland cut by rising water 2 to 4 hours before arrival of hurricane center. Considerable damage to piers. Marinas flooded. Small craft in unprotected anchorages torn from moorings. Evacuation of some shoreline residences and low-lying island areas required.

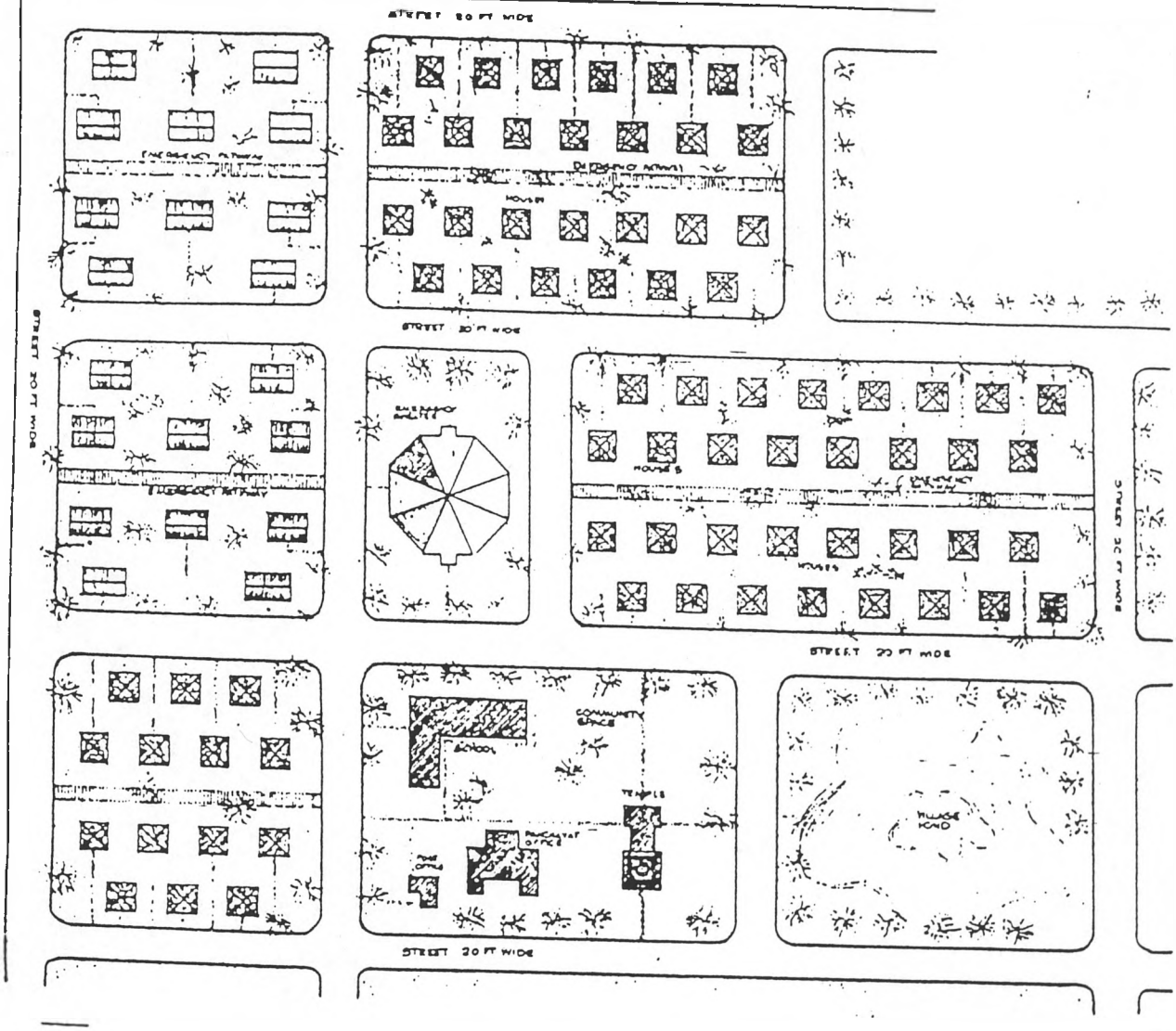
Scale No. 3: Winds of 111 to 130 miles per hour. Foliage torn from trees; large trees blown down. Practically all poorly constructed signs blown down. Some damage to roofing materials of buildings; some window and door damage. Some structural damage to small buildings. Mobile homes destroyed. And/or: storm surge of 9 to 12 feet above normal. Serious flooding at coast and many smaller structures near coast destroyed; larger structures near coast damaged by battering waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Flat terrain 5 feet or less above sea level flooded inland 8 miles or more. Evacuation of low-lying residences within several blocks of shoreline possibly required.

Scale No. 4: Winds of 131 to 155 miles per hour. Shrubs and trees blown down; all signs down. Extensive damage to roofing materials, windows and doors. Complete failure of roofs on many small residences. Complete destruction of mobile homes. And/or: storm surge 13 to 18 feet above normal. Flat terrain 10 feet or less above sea level flooded inland as far as 6 miles. Major damage to lower floors of structures near shore due to flooding and battering by waves and floating debris. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Major erosion of beaches. Massive evacuation of all residences within 500 yards of shore possibly required, and of single- story residences on low ground within 2 miles of shore.

Scale No. 5: Winds greater than 155 miles per hour. Shrubs and trees blown down; considerable damage to roofs of buildings; all signs down. Very severe and extensive damage to windows and doors. Complete failure of roofs on many residences and industrial buildings. Extensive shattering of glass in windows and doors. Some complete building failures. Small buildings overturned or blown away. Complete destruction of mobile homes. And/or storm surge greater than 18 feet above normal. Major damage to lower floors of all structures less than 15 feet above sea level within 500 yards of shore. Low-lying escape routes inland cut by rising water 3 to 5 hours before hurricane center arrives. Massive evacuation of all residential areas on low ground within 5 to 10 miles of shore possibly required.

Source: National Oceanic and Atmospheric Administration, *Tropical Cyclones of the North Atlantic Ocean, 1871–1977*, National Climatic Center, Asheville, North Carolina, 1978, page 25.

Cyclone Proof Settlement Patterns



From Building for Safety: A Case Study of Cyclone Prone Coastal Region of the Eastern State of Andhra Pradesh, India by Shri A.V S Reddy, I.A.S., Director General and Director, Centre for Disaster Management and Rural Reconstruction, National Institute of Rural Development, Rajendranagar, Hyderabad, 1991.